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BOOKS BY  
WILLIAM EMERSON RITTER

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THE HIGHER USEFULNESS OF SCIENCE.  
THE PROBABLE INFINITY OF NATURE  
AND LIFE.

THE UNITY OF THE ORGANISM, OR  
THE ORGANISMAL CONCEPTION OF  
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WAR, SCIENCE AND CIVILIZATION.

AN ORGANISMAL CONCEPTION OF  
CONSCIOUSNESS.

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RICHARD G. BADGER, PUBLISHER, BOSTON



# AN ORGANISMAL THEORY OF CONSCIOUSNESS

BY

WILLIAM EMERSON RITTER

*Director of the Scripps Institution for  
Biological Research of the University  
of California, La Jolla  
California*



BOSTON

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**The Gorham Press, Boston, U. S. A.**

## EXPLANATORY NOTE

This book is a reprint, with a few verbal changes necessitated by its mechanical isolation, of the last chapter (twenty-four), the preface, and the postscript of my larger work, *The Unity of the Organism, or The Organismal Conception of Life*. The title of the chapter is, *Sketch of an Organismal Theory of Consciousness* and I wish to emphasize the avowedly brief treatment of the subject as indicated by the term "sketch."

My reason for publishing this much of *The Unity* as a separate book is strategical. I hope the move will contribute to the winning of earlier and wider attention to the full treatise by two groups of students especially: Philosophers who have broken away from subjectivist idealism; and physiologists who have deeply sensed the meaning of physical chemistry in its application to living beings. To win more readers for the full work is my hope. And should the thing happen which I realize is possible, to wit, the usurpation by this chapter, which is primarily hypothetical, of the place rightfully belonging to the entire book, which as a whole is quite the reverse of hypothetical, I should be chagrined indeed.

But I am counting on an influence even stronger than the sense of fairness and consistency of students as a guarantee against such an outcome. It seems to me western civilization is entering on an era in which integrative conceptions and forces are going to determine the feelings, the thoughts and the acts of men much more than they have for the past three-quarters of a century. Already tendencies of this can hardly be mistaken in industry, in labor, in sociology and in government.

Science, philosophy and religion have not as yet shown much of this tendency. Specialization, particularly in the material sciences, differentiation, analysis, separatism, and isolation have dominated in these realms. Herbert Spencer did indeed move nominally toward philosophic and scientific unification. But his synthetic philosophy, so-called, partakes really more of the nature of a department store than of a truly synthesized body of natural knowledge.

Spencer failed in his effort to make Evolution function as a universally synthesizing principle for the simple reason that he failed to perceive the fundamentally integrative nature of the evolutionary process itself.

My enterprise as a whole, viewed as one in which the idea of synthesis occupies a central place, may be stated thus: So far as concerns all that vast expanse of living nature which comes under natural history as understood by Charles Darwin and his immediate predecessors and contemporaries, my conception of biointegration is set forth descriptively and factually, and with a very minimum of hypothesis in the chapters preceding the last (the twenty-fourth) of *The Unity of the Organism*. The discussion of psychic integration (chapters twenty-three and twenty-four) presents the relevant facts in such fashion as to demonstrate, I believe, a connection between mind and body which leaves no ground for the doctrine of psycho-physical parallelism to stand on.

The causal hypothesis of psychic phenomena sketched in the chapter here presented is one which links the animal organism more closely and positively with inorganic nature than any with which I am acquainted.

The proof or disproof of that hypothesis is dependent on psychology and biochemistry, primarily. Hence my purpose in making this chapter into a separate book may be stated more specifically as that of hastening the proof or disproof of my hypothesis of consciousness.

But while the wish to promote the scrutiny and test of this hypothesis is my main object, another object which attaches itself to this is hardly less interesting to me.

I refer to the question of what effect on physical and chemical conceptions themselves the application of physical chemistry to organic beings is likely to have.

If my surmise that physical chemistry itself is at heart hostile to atomism as materialistic metaphysics conceives it, is justified, a still more rigorous application of it to biological phenomena, and especially in the psychical domain, is likely to reveal that hostility more and more.



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## PREFACE

(TO "THE UNITY OF THE ORGANISM")

THE right of any book to live must be determined finally by what is on its pages. Nevertheless, when the author of a scientific book undertakes such a task as I have undertaken in this one, his natural and acquired fitness for carrying out his project ought to count in some measure toward the determination. An attempt to speak with some degree of originality and authority on subjects so remote from one another as are the chemistry of organisms, heredity, human consciousness, and the nature of knowledge, would be somewhat audacious even if made by an author of secure reputation as an investigator in one or more of these fields. When, however, the attempt is that of a complete stranger to all the fields, as thus judged, the attempt is no longer entitled to be called "somewhat audacious." It is audacious out and out, and if defensible at all is defensible in spite of its audacity. But the very nature of the task I have attempted seems to require me to contend that while it is audacious it is yet not impossible, and to point out something of my own qualifications for performing it.

Such professional fitness as I have rests primarily on my being a general zoologist in the proper sense; that is, a student of the phenomena of the animal world without exclusion of any aspect of that world from professional interest and some measure of professional attention. These facts of my vocation, and of my conception of the nature of that vocation are crucial for the quality not only of this book but all my general writings.

If once one becomes as deeply convinced as I am of both the fundamental unity and the fundamental diversity of all

nature; if, in other words, he becomes convinced that the whole of nature is, indeed, and not in mere expression, a *system*, the conviction will carry with it the perception that all specialized natural knowledge is absolutely dependent for meaning on the relation it has to its appropriate larger body of knowledge. Either analytic knowledge or synthetic knowledge of nature would be wholly void of meaning were it to be completely wrenched from the other. Most men of science perhaps, and most philosophers probably, would admit that this is true as an abstract proposition. But what about its truth when brought to the test of particular cases?

The audacity of my enterprise really consists in my attempting to act according to this general truth in a particular case—the case, that is, of the phenomena of animal life. I have gone on the assumption that knowledge of animal chemistry, for example, at one extreme, and of human consciousness at the other, would be simple blanks as to meaning but for the relation of the two knowledges to each other and to still more general knowledge of animal life. Could we imagine a chimpanzee possessed of as much laboratory knowledge of organic chemistry as an Emil Fischer, that knowledge would be really meaningless were the creature's mind that of a chimpanzee in all other respects.

A systematic defense of a conception of zoology based on a general theory of natural knowledge such as this, can not, of course, be thought of in a preface. Indeed, such a conception can not be fully justified by any argument merely *for* it. The justification must be found largely in a worked-out application of the conception itself. In other words, the very fabric of this book must be the chief justification sought. All I can wish to do in a preface is to mention certain subsidiary ideas and principles that have been specially influential in determining the plans of my undertaking; and certain methods and disciplinary preparations and pres-

ent conditions that have been specially useful in carrying them out.

(Probably no one zoological item has influenced me more than the perception that the evolutionary interpretation of man does not mean that man's derivation from the lower animals made him something that is now not animal.) It means that man is just as much an animal to-day as were his prehuman ancestors. The truth is exactly stated by saying that when the transformation took place by which man came into existence that transformation was from a lower to a higher stage of animal life. The actual problem, consequently, of man's nature is not as to what man is in *opposition* to animals, but as to the *kind*, or species of animal he is.

With the distinction here made once fully grasped comes the revelation that man is an object of zoological research and treatment no less certainly than is a horse, a fish, a lobster, or an amoeba. But since man's highest, that is his *psychical* or *spiritual* attributes are the ones most decisive of his *kind*, it is these attributes which make him particularly interesting, zoologically speaking—just as, for example, it is the attributes of a horse as *a horse*, and not as an animal generally that elicits our particular interest in the horse. Zoology rightly understood is preëminent among all the sciences as the science of particulars. This important truth seems to have been first appreciated by Aristotle; and the fact that one of the most fundamental differences between him and his teacher, Plato, concerned the doctrine of Particulars as opposed to that of Universals, is probably connected closely with Aristotle's great interest in and attention to zoology. I have not seen any reference to this surmise by writers on Aristotle and his philosophy, yet it appears to me highly significant.

From these perceptions relative to the nature of man and the science of animal life, it follows that when the zoological

study of man is undertaken—when the general zoologist becomes for the time being an anthropological zoologist—all the best tested and most approved methods of that science are taxed to their uttermost, simply because of the great complexity of the species under examination. Now it is absolutely beyond question, I believe, that of the methods employed in the biological sciences, none are more important, especially for the study of man, than those of description and classification with their necessary accompaniment, comparison. The essay *The Place of Description, Definition and Classification in Philosophical Biology* in my little book, *The Higher Usefulness of Science*, treats of this subject somewhat at length. But that to which I attach much more importance is that almost everything contained in the present book, except the heart of Chapter 24, I regard as an embodiment of the fundamental principles of descriptive and classificatory biology as these principles are established by modern research.

It seems to me I am privileged to claim that no reader of this and other general writings of mine is in position to pass judgment on them, except, of course, as touching trustworthiness of observation and statement, and of dependability of authorities cited, without having considered conscientiously my position as to method. For instance, am I right or wrong in holding (see the above mentioned essay) that far the larger part of what is usually called explanation in dealing with the phenomena of nature is really partial or tentative or hypothetical description and classification? What justification and scope are there for my contention that the motto "neglect nothing," which has long done good service in taxonomic research based on morphology, must be extended to all departments of structural and functional biology? What grounding and applicability are there for my distinction between synoptic and analytic description, and synoptic and analytic classification? Not until one has come to see that

questions of this sort are necessary consequences of progress in information about, and interpretation of living nature, is he able to appreciate fully what I mean by chemical and psychological zoology. Formal biochemistry and animal psychology, that is, the chemistry and the psychology of laboratories devoted to these subjects, are to my zoological eyes really quite incidental and partial and crude, albeit immensely important. Let one once feel the full weight of the inductive evidence favorable to the hypothesis that every organism whatever performs every jot and tittle of its activities through chemico-physical agencies, and he must at the same time feel the meagerness and crudity, comparatively speaking, of even the fullest and best laboratory knowledge of those agencies by which he himself, let us say, operates as he carries through and expresses in words an argument like that now occupying us.

The absolute trustworthiness of the main findings of laboratory biochemistry and its incalculably great importance, but at the same time its great imperfection as compared with natural biochemistry, are what especially impress me as I bring my best powers to bear on the deepest, most distinctive problems of anthropological zoology; problems, in other words, of the *human* animal.

Such an attitude toward biochemistry will, I hope, be recognized even by biochemists as calculated to induce at least a receptive frame of mind toward knowledge in this domain. It should be one important qualification for "reading up" in the domain. But certain it is that something more than a receptive mind is essential to enable one disciplined in one field of science to be a successful gleaner of ripened fruit in another field. It is not true that all the domains of natural knowledge, highly developed as they now are, are enough alike to make training in any one an adequate preparation for acquiring second hand knowledge in every other. At least a background of systematic instruc-

tion in a particular science is requisite to make a highly successful reader even in that science.

So far, then, as I am able to pass upon my own qualification for making such use as I have made of biochemistry, it is a question of whether I have a sufficient ground-work of formal training to make me a safe chooser among authorities and estimator of the significance of their results.

Although my chemical practice was limited to three years, one of these as a student assistant, so much did I live in the laboratories during that period, that even to-day the opening of a book or journal on chemistry seems to fill my nose with foul though pleasantly reminiscent odors and to encrust and stain my fingers with diverse corrosives—all of which may mean that I was more a musser in chemicals than a real student of chemistry. Nevertheless I verily believe the experience enabled me to be a more intelligent reader of chemical writings.

As for the science of mind, I am obliged to own that I have never spent a day in an experimental laboratory of either animal behavior or human psychology. But I own also that for this I am not regretful if such defect of training be an essential condition of escape from the narrowing of interest in and conception of "behavior" which has attended later work in this field. I do not believe, however, that this is the only way of such escape. Zoologists must realize before long, I am quite sure, that laboratory experimentation in animal behavior can be only a rather minor agent for the task of understanding the psychical life of the animal world as a whole.

This leads to the remark I wish to make about the discussion of psychic integration in the last chapters of this book. One of the most important things accomplished by that discussion is, I estimate, the calling attention to the tendency of instinctive activity to excessiveness over the actual needs served by the activity. Why has this truth (for there can

be no question that it is a truth) not received more attention from modern behavior specialists? There are probably several reasons, but a particularly influential one seems to be the fact that the very purpose, and the method of experimentation involving the idea of control by the student are such as to encourage overlooking the phenomena, and to obscure their significance even if they are noticed.

Unorthodoxly enough from the standpoint of present school psychology, my entrance into this realm was from the side of the nature and the theory of knowledge. And so far as my explorations in the realm have gone, two men, Aristotle and the late Professor G. H. Howison have influenced me so vitally that I must say a few words on the subject.

For many years Aristotle was two distinct persons to me, so far as any real influence upon my thinking was concerned. On the one hand there was Aristotle the metaphysician to whom I had been formally introduced by Howison in a private outside-of-hours University course (which with great generosity he had given me), the medium of the introduction being the *De Anima*. On the other hand was Aristotle the zoologist, acquaintance with whom was at first picked up in the usual naturalist fashion, but which had later ripened into intimacy, as I like to characterize it, by our common interest in marine zoology, his good description of the anatomy of a tunicate being a special passport to my affection. It would hardly be an exaggeration to say that all my philosophizing in biology has aimed at fusing these two Aristotles into one. I do not mean that this has been my conscious and express aim. It has been so only instinctively, or intuitively, or "at heart," or by "working hypothesis," or by whatever expression one chooses for it. And here comes the part played by Professor Howison: As I take a bird's eye view now of what is set forth in this and other general writings of mine, and contemplate the whole in

the light of the preface to Howison's book, *The Limits of Evolution*, and then look reflectively back over my thirty years of contact with him and his teachings, most of it incidental and fitful, but some of it rather close, a few influences of his, some positive and some negative, stand out sharply indeed. The positive influences I mention first. No other influence contributed so much to my belief in the power of reason; that is, in a substratum of truth to the idealistic philosophy. Again no other influence contributed more to my belief in persons—in the power of personality; that is, in a substratum of truth to the Howisonian philosophy of personal idealism.

A statement of the negative influence coming from the same source takes us back to Aristotle. In the preface to *The Limits of Evolution* Howison writes, referring to his own theory of Personal Idealism, "The character of the present theory, relatively to Aristotle, is to be found in its attempt to carry out the individualistic tendencies in Aristotelianism to a conclusion consistently coherent." This statement I could almost adopt word for word as a characterization of the purpose that has animated all my general thinking and writing. Yet how profoundly does the outcome of my efforts differ from that resulting from Professor Howison's efforts! And here is the kernel of my present remarks: In commending to me the *De Anima* of Aristotle and generously undertaking to guide me through it, as a response to my appeal for help toward clarifying my mind concerning the deeper, the philosophical meaning of biological evolution, my greatly learned and much esteemed teacher had a purpose, I am now quite sure, that is impossible of realization. That purpose was to show that Aristotle failed in his effort to recognize a "real world" through combining "ideal form" with "real matter," because for him a real world was more fundamentally a sense-experienceable world than is actually the case. As I labored through the



*De Anima* I recall that I was disturbed by the rather cavalier fashion in which we disposed of those portions of the work which treat of reproduction, nutrition and growth, and especially the portions dealing with the senses. At the stage of scientific development I was then in, I knew little or nothing of Aristotle's biological writings, and Howison referred to them only in the most cursory way, if indeed he mentioned them at all. Certain it is he did nothing to arouse my interest in them, or to indicate that he regarded them as specially significant in connection with such important views of Aristotle's as those on the relation of Body and Soul. The question which now seems to me indispensable for grasping the essence of the Aristotelian psychology and philosophy that, namely, of why Aristotle was so greatly interested in zoology, and devoted so much time to its study, never came up during the course, I am quite sure. In science and philosophy as in everything else, the character of one's interests is a surer index to his general views and attitude than is anything he can express verbally. There may be ambiguity and error in Aristotle's theory of "synthetic Entelechy." This theory may, probably does, "beset," as Howison remarks, "all individual existence both behind and before," thereby implying some theoretical derogation from the real nature of personality. But over against this error and ambiguity stands indubitable proof of Aristotle's practical faith in the Particular, the Individual, that proof being the vast labor he expended in learning and interpreting the life of the animal world. The chief philosophic significance of Aristotle's zoological works is not in any information or theories they contain but in the fact that he produced them at all, since, as mentioned above, zoology is pre-eminent as the science of particulars, and his doctrine of Particulars as opposed to Universals was very close to the heart of his whole philosophic system.

This prepares for my final remark about the influence upon

my thinking of Professor Howison and the idealistic philosophy generally. That philosophic Idealism, no matter of what variety, contains elements that are fundamentally erroneous seems to me to be proved more conclusively by its inadequacy for understanding the world in its entirety than by any particular errors of fact or reasoning which it can be shown to contain. Were all men philosophical idealists, there would be no natural science, merely because in the domain of learning men will not choose as their primary life work what they fully believe to be of secondary importance.

Fallaciousness or inconclusiveness of argument never deterred me half as much from embracing Professor Howison's teachings in their entirety as did his usually dignified but always-present presumption of professional self-superiority over all his colleagues who did not come under the, to him, sacred ægis of Philosophy. The reason why sincere humility and the spirit of democracy are alien to all forms of idealistic philosophy becomes clear once one attains a world view which truly strives to include, but makes no pretense of having already included, the whole world wholly in that view.

There remains the pleasant though difficult task of mentioning the few among my numberless obligations which are so personal and weighty that to leave them unacknowledged would be to brand me as ungrateful, more conspicuously than I can endure.

First as to those persons and conditions which, during the last ten years, have relieved me from the routine duties of a University teacher, and also from most of the exactions customarily attaching to an administrative post even in an institution of scientific research, and have given me a status the central purpose of which is scientific work. Whatever be the quality and final significance of my life-work, could these, I ask myself, have reached as high a level as they have reached had I not come into my present position? Al-

most certainly not, must be the answer. And beyond a doubt the raising of the question involves principles of organization for scientific research that lift it high above mere personal concern.

No faith of mine is greater because none is rooted more deeply in my scientific philosophy, than that in the ultimate triumph of popular, that is of democratic principles in all aspects of civilization. Indeed the *facts*—not the *theories*—of organic unity and integration which have dominated all my later work are the foundation of this faith. Whether my particular hypotheses and theories of organismalism succeed or fail, there still are the raw data on which they rest. These can not fail. If success does not crown my efforts in handling the data it will crown those of others who shall come after me. And when the principles for which I contend shall have worked themselves more fully into the fabric of civilization, the organizational, the administrative, and the scientific policies aimed at in the Scripps Institution for Biological Research of the University of California will be recognized as fundamentally sound. I will be specific here to the extent of mentioning the policy of providing a special business management for such institutions.

Although my indebtedness to my professional co-workers and official associates of the Zoological Department and the Museum of Vertebrate Zoology at Berkeley, Professors C. A. Kofoid, S. J. Holmes, and Dr. Joseph Grinnell, is indicated by special references in the body of this book, I should be sorry to have these references taken to indicate the full extent of my obligation to them, or to indicate that these are the only members of those departments to whom I am indebted.

It would be a source of keen regret to me, too, should my single short reference to two of my biological associates on the staff of the Scripps Institution, Mr. E. L. Michael and Dr. C. O. Esterly, be taken as the full measure of what I

owe to them. I hope that my reference to their work, brief though it is, will be recognized as indicative of the high importance I attach to what they have done and are doing.

But what about my indebtedness to professional associates here in the home group of whose work no mention is made in my text? How subtle and far-reaching and innumerable are the influences which bear upon one from his daily co-workers! For example, by what unit of measurement could be gauged the effects on my treatment of heredity, which have come from my perpetual contact with the work of Dr. F. B. Sumner and Mr. H. H. Collins? But these men would probably resent the ascription to them of responsibility for my main conclusions in this field. Again, not many "environmental factors" have been more determinative of my present feelings (I hardly dare call them views) relative to various problems in geo-physics, and relative to quantitative methods in natural science, than have Dr. G. F. McEwen and his oceanographic work. Yet I hesitate even to mention this fact lest some one be led thereby to hold Dr. McEwen accountable for crudities, actual or implied, I may manifest in these domains.

Nor are my indebtednesses confined to the narrow circle of my immediately professional and official co-workers. Indeed I am keenly conscious of great debts beyond this circle. These are so numerous and on the whole so general as to make specification impossible, but I cannot pass by without mentioning my debt to my long-time and much-cherished friend, Professor G. M. Stratton, for the commentaries on the chapters on psychic integration made by him while this portion of the book was in an advanced though still formative stage.

For aid in structural labor, as it may be called, my dependence upon Mr. Frank E. A. Thone, my secretary and scientific assistant, has been varied and intimate, and of a quality for which money can only partly pay.

To Dr. Christine Essenberg, librarian and member of the scientific staff of the Scripps Institution, I am indebted for help on the index and glossary.

And finally, what can I say about the part played in the creation of this and my other works by her to whom this volume is dedicated? The extent to which her life is involved with mine in these works only we two can know; but the wording of my dedication indicates something of the character of that involvement.



**AN ORGANISMAL THEORY  
OF CONSCIOUSNESS**





# AN ORGANISMAL THEORY OF CONSCIOUSNESS

## *Remarks on the Hypothetical Character of this Chapter*

**H**YPOTHESIS and theory will dominate in the task upon which we now enter and in this respect the present chapter will differ sharply from the preceding chapters. Fact, description, classification, and restrained generalization have been the leading motives up to this point. One main and several subsidiary hypotheses will be central in the discussion. Into the presence of these will be summoned many of the facts and generalizations previously set forth. The purpose in this summoning will be on the one hand to test the hypotheses by the facts and generalizations and on the other hand to see how the facts will look in the light of the hypotheses.

This announcement of the hypothetical and theoretical character of the task now before us, will give us two advantages: It will justify a dogmatic form of expression at times which we should not otherwise feel privileged to use; and will justify a brevity of treatment which would not be possible were we aiming at thorough generalization and demonstration. Hence the justification of undertaking to deal with so vast and vital a subject in the limits of a sketch.

## *The Natural History Method and the Study of One's Self*

Insistent as I have been on the importance of the natural history way of approaching the phenomena of the living world, in entering upon the present discussion I must em-

phasize this more than ever and must call attention to the particular character of this importance in our present undertaking.

The natural history method of viewing organic beings is *per se* the comprehensive method, one of its best mottos being, as we have repeatedly seen, "neglect nothing." That knowledge of organisms separates itself sharply into departments is no deterrent to the naturalist against utilizing any knowledge he may come upon that will contribute to his main aim—that of understanding organisms. Who or what shall restrain me from observing and carefully thinking about any fact of my own being which promises to help me on my road to such understanding? The foremost zoologists, of modern times especially, have amply recognized and freely used this principle so far as all physical and some of the lower psychological attributes are concerned. But when it comes to man's higher psychological attributes, zoologists have usually said, sometimes expressly, sometimes tacitly, that these belong to a wholly different realm, a realm with which we have little or nothing to do. And their position of "hands off" as touching man's higher psychic life, has received the readier, fuller sanction in that it has accorded well with the prevalent views and practices of those students, anthropologists, economists, sociologists, and ethicists who have made these higher reaches of human life their special fields of inquiry. But the course of nature can not be permanently thwarted. Such an attempt to wrench human life asunder is bound to fail finally. In the several subdivisions of biology, normal advance has tended to stay the wrenching process, comparative psychology being notable in this tendency.

The opposition to such organic disunion consistently maintained throughout this book reaches its culmination in these chapters on psychic integration. In what follows we shall pass more freely than ever from one phase or aspect

to another, over the entire gamut of psychic life both in the individual and in the animal kingdom. If facts of my own subjective life will serve my purpose, I shall be as free to requisition them as to requisition facts of any phase or aspect of my objective life. If the ethical or esthetic or social attributes of the human animal will best illuminate a point, these shall be brought in with as little misgiving as will be anatomical or embryological or physiological or instinctive attributes.

So great store do I lay on this catholicity of attitude toward psychic life, that I shall show by a single instance that at least a few other present-day zoologists have somewhat similar feelings about the zoological character of psychical phenomena. Referring to the controversies which have inevitably arisen over the problem of instinct, W. M. Wheeler says that such controversy "is pardonable, at least to some extent, since the subject itself presents no less than four aspects, according as it is studied from the ethological, physiological, psychological or metaphysical points of view." "From the first two of these," the author continues, "instinct is open to objective biological study in the form of the 'instinct actions.' These may be studied by the physiologist merely as a regularly coördinated series of movements depending on changes in the tissues and organs, and by the ethologist to the extent that they tend to bring the organism into effective relationship with its living and inorganic environment. But that these movements have a deeper origin in psychological changes may be inferred on the basis of analogy from our own subjective experience which shows us our instincts arising as impulses and cravings, the so-called 'instinct-feelings'; and these in turn yield abundant material for metaphysical and ethical speculation."<sup>1</sup> From the context of these sentences we may infer that Wheeler recognizes that the four aspects mentioned under which the subject of instincts presents itself, represent the same num-

ber of valid departments of man's mental life. The point I wish to make is that although a zoologist may recognize without cavil that speculation on psychological, ethical, and metaphysical problems which arise in connection with instincts, are legitimate activities of man, and might properly deny that it is incumbent upon him to do much speculating of this sort, yet it would be incumbent on him to take due cognizance of these speculative attributes of the human animal. A truly scientific zoology can not justify itself in issuing a manifesto to the effect that certain attributes presented by some animals do not fall within its province. It may more or less constantly neglect or refuse on practical grounds, to deal with certain attributes; but that is a very different matter from a formal declaration such as many present-day zoologists make, that with these attributes zoology has nothing to do. Such a declaration is self-stultifying, if not self-stultifying, in that it is a virtual self-inhibition by zoology of its own growth.

These reflections may be terminated by defining the motives and the mental attitude with which I approach the great problem of consciousness. I come to it not as a metaphysician, not as a psychologist, not as a physiologist, not even as an anthropologist, but as an anthropological zoologist; as a zoologist who in course of his regular professional work takes up the animal group of which he himself is a member, chancing as he does to possess among other attributes that of knowing his own life *directly*, that is, through subjective or self-conscious experience, as well as *indirectly* through objective experience.

Approaching the problem of consciousness in such an attitude and for such a motive, it is impossible to view it otherwise than as one aspect of the larger problem of life generally. For while the psychologically and metaphysically important question of whether consciousness is coextensive with life need not be raised by the naturalist, the indubitable

fact that at least a large sector of life is conscious; in other words, the fact that consciousness is a part of life, he can not ignore if he is to deal with consciousness at all. For the naturalist, then, no hypothesis or theory of consciousness can be satisfactory which is not clearly and expressly embedded in and an essential part of an hypothesis or theory of life generally. Our central hypothesis, drafted in accordance with these principles, may now be given.

### *Formulation of the Central Hypothesis*

*All the manifestations which in the aggregate we call Life, from those presented by the simplest plants to those consciously psychical nature presented by man and numerous other animals, result from the chemical reaction between the organism and the respiratory gases they take, oxygen being almost certainly the effective gas for nearly all animals. An essential implication of this proposition is that every living individual organism has the value, chemically speaking, of an elementary chemical substance.*

Let us be promptly explicit in recognizing the character of the two propositions contained in this hypothesis. They are manifestly chemical in large part, and a complete demonstration of their truth is impossible without the aid of chemical research focussed directly upon them. But though clearly chemical, equally clearly they go beyond—far beyond—present chemical knowledge. To speak of a whole organism as equivalent to a chemical element seems at first sight not only unwarranted by positive chemical knowledge, but opposed by such knowledge. Furthermore, the term “reaction” as used in the first proposition undoubtedly seems quite foreign to the technical meaning which chemistry has attached to the word. Indeed so remote to say the least, are these fundamental propositions of the hypothesis from definite chemical knowledge, that if they are entitled to rank

as constituting a legitimate scientific hypothesis, this must be on grounds other than those of present-day technical chemistry quite as much as on those of such chemistry. In attempting, consequently, to establish the propositions on a true and useful hypothetical basis, it will be permissible to notice these other grounds first.

### *Preliminary Justification of the Hypothesis as Such*

The proposition that each living individual has the chemical value of an elementary substance, will receive attention first, and the initial step will be to inquire what, in general, the criterion is of an elementary chemical substance. Here, for instance, is a lump of phosphorus. In virtue of what is it declared to be such a substance? Not primarily, let us specially notice, because the phosphorus is *simple*, that is to say, is an element in the sense of not being reducible to still simpler substances. Rather the basal criterion of its being a chemical substance is that upon its being brought into contact under certain conditions with certain other chemical substances, oxygen for instance, there is produced a third substance having very different attributes from either of the original substances. Transformation of substances chiefly through interaction upon one another is the foundation fact which has brought it to pass that substances are described as chemical. That is the fact upon which the science of chemistry primarily rests. Facts and problems of simplicity and complexity, relative and absolute, are later and secondary. The task of chemistry "consists in the investigation of substances and those of their processes by which the physical attributes of the substances undergo permanent changes." (*Handwörterbuch der Naturwissenschaft.*)

Every adequate definition of chemistry and chemical substance and chemical action contains the idea of transforma-

tion in one form or another.) Clearness on this point is indispensable to our purpose. Chemistry is too often defined, even in elementary text books and in dictionaries, as though the "composition of matter" were its initial and most essential function. But this conception is surely contrary to the history and most essential nature of the science. There is, it seems, entire agreement among competent writers that scientific chemistry is a direct descendant of Alchemy, and a very imperfect knowledge of the history of Alchemy reveals the fact that the every-where present, normal transformations in nature, particularly in inorganic nature, were the foundation phenomena of this old art. One has only to recall the place held by the idea of the transmutation of metals, this idea having usually the practical aim of changing the "base metals" into "noble metals." The "philosopher's stone" and the "great elixir" were magical somethings by which the transmutations could be accomplished.

Greatly significant from our standpoint is the fact that one of the objectives of Robert Boyle (middle of the seventeenth century), who, perhaps as much as any one man, is entitled to be called the father of experimental chemistry, was to rectify the false and mystical notions prevalent in his time about "Elements," "Principles," "Essences," etc. "Tell me what you mean by your Principles and your Elements," Boyle demanded, "then I can discuss them with you as working instruments for advancing knowledge."<sup>2</sup>

What is "behind" the transformations—forces, elements, principles, essences, spirits or what not—is indeed an important and, properly asked, a legitimate question. But—and here is the most vital fact of all—it is a question which can not be raised even, until *after* the transformations have been observed, nor can an answer of objective value be given unless the whole round of observed phenomena, the substances previous to transformation, the transformatory processes, and the new substances, be accepted at their face value, that

is to say, at a value which is as near to ultimate truth as any truth whatever, connected with the phenomena.)

The elemental constitution of bodies is an inference, always and solely, drawn from their observed corporeal attributes. And chemistry is the science which assumes the task of drawing, elaborating, and systematizing these inferences on the basis of the transformation of the attributes. The meaning of the statement that chemistry is one of the natural sciences is that chemistry is the science which uses its natural history observations to penetrate still more deeply into the constitution of bodies. *Natura a natura vincitur*, nature is surrounded by, is contained in nature, is as fundamental a truth for chemistry as for any other natural science. (A living being is as much a natural body as is a piece of phosphorus, and its obvious attributes, its outer-layer attributes, are as essential to its nature as are its inner, its hidden attributes.) So any genuinely transformatory changes, and genuinely new products arising through the reaction between the living body and some other body is so far chemical in nature, and the reacting bodies are so far chemical.

A long step toward justifying the proposition that each individual living organism has the value, chemically, of an elementary substance, will be taken if it can be shown that any qualitatively new product whatever results from the interaction between the organism acting as a unit, as one, as an element, and some other element. Having regard to the entire world of living beings, the chances for finding new products which may have arisen in this manner are practically if not theoretically infinite. Manifestly, then, only a very small sector of the entire range of such possible productions can be searched. It must, consequently, be our aim, as always in handling inductive natural history evidence, to choose for examination evidence which shall be most clear-cut, most illustrative, and most convincing.

The sector of organic phenomena best capable of yielding



such evidence is, I believe, exactly this of psychic life. And within the great range of this life, the higher conscious life of man is most replete with the evidence we seek. Again within the range of man's higher life, each individual's own private life, even his subjective life, his consciousness, is the evidence most certain and convincing. Translating this last statement into familiar language, one sees that it is only another way—the scientific way—of affirming the truth, that the greatest of all certainties of which man is capable is that of his own existence. I am saying, virtually, that when we analyze, after the manner of objective science, this old familiar affirmation about certainty, and carry the analysis as far as we are at present able to, we find that the sense, or better, the feeling of certainty of self-existence and self-identity is in last analysis one of the effects of a transformational interaction between ourselves and some substance (oxygen?) in our breath, as stated in the first of our two propositions.

That proposition seems then to be hardly more than a recognition that psychic phenomena containing at least the germ of consciousness is a kind of chemical product which has not heretofore been clearly recognized as such, the lack of recognition being due to the strangeness of the product as compared with any chemical products with which experimental chemistry has hitherto occupied itself. But looked at in a really broad and deep way, is it any more difficult for me to interpret a state of consciousness in myself to be a result of chemical action between me and the air (oxygen?) I breathe, than for me to interpret the dim greenish-white luminosity of a piece of phosphorus to be a result of the chemical action between the phosphorus and the air essential to the glowing? From a purely chemical standpoint I do not believe we have any ground for holding that some products of chemical reaction are more comprehensible or less comprehensible than are others.

Chemically viewed the problem now on our hands is entirely one of *fact*—fact as determined by observation alone, and by observation with the aid of experimentation. If it can be shown that each individual conscious being really does behave like a chemical substance in the process of reacting; and if the result of such reaction can be shown to have even one of the essential marks of a chemical product, both propositions of my two-parted hypothesis are warrantable and the hypothesis becomes genuinely scientific—a genuine “working hypothesis”—one, that is, for bio-chemistry to take seriously.

### *More Systematic Justification of the Hypothesis*

That the propositions are demonstrable to the extent of the demand just indicated is my contention. This contention I will now try to make good and will begin with a few remarks on a question concerning the hypothesis which ought to arise instinctively in the mind of every one. That question is: Does such a conception of psychic life and consciousness as that contained in our hypothesis imply any real infringement upon or derogation from *me*, in the deepest sense a real entity properly designated by the terms *person* and *personality*?

On saying that this query ought to arise *instinctively*, I do not mean *ought* in the ethical sense, but in the organismal sense. That is, in a sense which implies that the very nature of the conscious organism is that it is not only self-existent in a measure like every natural object, but that it is self-identifiable, and within certain bounds, self-determinative of its own acts. Now recognizing it to be thus by its “very nature” is only another way of recognizing that it is so in its instincts as well as in its physical organization. But since instinct is more fundamental, more deep-rooted in the organism than is intellect, as phylogenic and ontogenic psy-

chology make clear, if a pronouncement implying a derogation from the reality and natural prerogatives of the individual be issued from the intellect, a response of protest and antagonism would be expected from instinct. This would be expected as an ordinary organic impulse to self-defense and self-preservation.

*The Nature of "Outer" or Objective and "Inner" or Subjective*

What we have to do consequently is to scrutinize the conscious individual in order to see if it presents any uniqueness of attributes and of transformatory power in reacting with other bodies that is on a par with the uniqueness of an ordinary chemical substance in the same respects. Now it is, as suggested some pages back, exactly in the conscious, the subjective life, that such uniqueness is most easily demonstrable. There are several ways in which the conscious individual manifests this uniqueness. A particularly convincing way, I think, is in the relation between what are commonly known as the objective, or "outer," and the subjective or "inner" sides of mental life. This, consequently, will be the approach to the subject chosen by us and we will enter upon it by returning to Royce, first to his "Outlines of Psychology," then a little later to some of his specifically philosophical writings.

In the first chapter of the Outlines, devoted to initial definitions and explanations, Royce states, simply and clearly, a distinction "between our physical and mental life," which elsewhere he has worked out with great elaboration. Thus: "Physical facts are usually conceived as 'public property,' patent to all properly equipped observers. All such observers, according to our customary view, see the *same* physical facts. But psychical facts are essentially 'private property,' existent for one alone. This constitutes the very conception

of the difference between 'inner' psychical or mental, and physical or 'outer' facts." <sup>3</sup>

Ever-present, and obvious as is the comparison here made, it nevertheless is of so great importance that we must stop and reflect upon it, for we shall surely fail to grasp the full measure of what is to follow if we are lukewarm toward one of the elements of it. The element I refer to is the *uniqueness*, the essentially *personal* character of inner as contrasted with outer facts. Every normal person is ready enough to insist that his thoughts, his feelings, his emotions and all the rest of his higher psychical experiences are *his* and *his alone*. The tremendous reality and force of the rights of "private opinion," of "personal conscience" and so forth, among civilized men, hardly need to be expatiated on.)

The character of the uniqueness of these experiences, however, concerns practical living less vitally, so we give it less attention. The whole vast range of my mental life, from the lowest, simplest, vaguest sensations to the highest, most bewildering complex emotions, passions, imaginings and thoughts, are my own, absolutely, so far as other persons are concerned. I cannot share them to the least extent with another person. Of course I can let others, especially my most intimate associates, my dearest friends, know a good deal *about* these experiences of mine. But after all, gladly as I would share many of them with these friends, it is utterly impossible for me to do so. *My* experiences must remain wholly outside of *their* consciousness. No two persons can have the same experience any more than they can have the same hands or stomachs. Nor is this all. If mental life is subject to the general biological laws of variation into which we have latterly gained much insight, I am obliged to suppose that these experiences of mine, the whole retinue of sensations, feelings, emotions and thoughts, differ somewhat from the corresponding experiences of other persons. And all observation confirms this supposition—much of it strong-

ly. Inferential evidence could hardly be stronger than that my particular emotional response to opera singing, for example, is quite different from that of many other persons.

Obviously we are here skirting the edge of what modern realism in formal philosophy calls pluralism, and deals with in part as the question of whether percepts are strictly individual and personal. No philosopher with whose views I have become acquainted, has discussed this question so fully, and in my opinion, so illuminatingly as Sellars. The following sentences taken from his chapter, *The Advance of the Personal*, show clearly, it seems to me, that the conclusions he has reached, working from the purely philosophical side, are essentially the same as those arrived at by me, advancing from the biological side: "What may be called the sensory content of our percepts is important,—I do not wish to be understood to belittle it,—but so are the meanings which arise in connection with our bodily activities and motor adjustments to stimuli. Here again, we are face to face with individual factors in perception which even the idealist must recognise and somehow explain. Evidently, perception is not a mere passive presentation, but a construction whose genetic elements can be partially traced. Finally, let us call to mind that percepts are continuous with feelings and with the so-called organic sensations. . . . Once vaguely objective, feeling is now considered subjective or personal."<sup>4</sup> Many other sentences and paragraphs of like purport could be quoted from this author. I have selected this for the two-fold reason that it indicates the measure of my agreement with his view as to the personal character of percepts and the rest of conscious life; and at the same time indicates wherein I shall have to out-do him in the matter of validating the individual. A part of our task, to be reached a little later, will be to show that although feeling and all the rest of psychic life is indeed subjectively personal, it is also objectively personal. In other words, it will be my task to

remove, or at least to show the way to remove, the vagueness which Sellars asserts, rightly, has hitherto clouded this side of personality. To do this thing is, indeed, one of my most important chances to contribute to a "better philosophy of life."

But since our psychical life, especially our conscious life, is a vast—incalculably vast—complex of experiences, of "contents," sounds, sights, memories, feelings, ideas, many of which are set off very sharply from the rest, are clearly characterizable, and are wonderfully persistent; and since innumerable of these are coming along all the while which have much of genuine newness about them; and since further, these contents of consciousness are intertwined with and are determinative of a vast complex of other contents called volitions which in turn are linked up with and are more or less directive of bodily activities of many kinds, some purely reflex and some instinctive, it seems impossible to escape recognizing, even if one wanted to, that if the verb "to create" has any definite meaning at all the normal, self-conscious animal organism is about the most creative thing we know or can conceive. Indeed it is altogether likely that the very notion of creation, whether natural or supernatural, came initially from the creative activity and the impulse to such activity, of man himself.

We may justly say, I think, that we know all creativeness, chemical creativeness with the rest, through being in our own deepest natures creative, that is, transformative and transformative in the way which we call chemical. We learn *about* the processes of life and call some of the most essential of them chemical just by *performing* those processes as some of our most essential attributes. A portion of the process which goes on within us, together with the corresponding product, constitutes what we call the science of bio-chemistry. This means that according to our hypothesis "objective" and "subjective," or "outer" and "inner" as applied to

life, are something quite different from what they have been either in traditional philosophies, or in most, at least, of recent psychology. "When we speak," Royce writes, "of our physiological processes as internal, the word 'internal,' although it here generally implies 'hidden, in whole or in part, from actual outer observation', does *not* imply 'directly felt by us ourselves.'"<sup>5</sup> My hypothesis implies a denial of the correctness of this statement. I say that in the sum total of the "contents of consciousness," a nether segment, as one might call it, of physiological processes is "directly felt by ourselves." *There is no content of consciousness which does not contain an element that is internal or subjective in whatever sense any other content of consciousness is internal or subjective.* And per contra, *there is no content of consciousness which is not objective to some extent, in whatever sense any other content of consciousness is objective.* The mind, according to this conception, is not something which uses the brain or any other part of the organism merely as a tool with which to make thoughts and other contents of consciousness. Nor on the other hand is consciousness of the nature of a secretion, the gland for which is the brain, though unquestionably the brain has an essential part in the production of thought and the higher contents of consciousness. Among the consequences of the reaction between the organism and the air we breathe are consciousness with its marvellously rich and varied contents.

But at this point I must specially request the reader to notice that I am not pretending to describe and explain all the contents of consciousness. In other words it is not a *theory of knowledge*, but a *theory of consciousness* that I am sketching; and knowledge in the strict sense, and consciousness are very different. They differ, according to my understanding, much as the fully developed, physical organism differs from the living substance, or protoplasm, of which the organism is composed. Consequently I am not

even concerned primarily with sensation in so far as this implies sense organs or even nerves and nerve terminals of the simplest kind. Rather I am dealing with the stages and conditions antecedent to consciousness and in which it is latent, in much such way as the cytologist when he studies the living substance of all sorts of tissue-cells is not dealing with organs and the organism in the full sense, but only with their substrata. But although it is not knowledge, properly speaking, either in its conceptual or perceptual aspect that I am discussing, since my enterprise does take me across the border line and a short distance into the realm of knowledge, I must, in the interest of historical continuity and setting, say a little more than I have said about the general nature of knowledge.

My assertion should be taken literally that there is no content of consciousness which is purely either subjective or objective, inner or outer, conceptive or perceptive, ideational or impressional, or whatever form of expression be given the antithesis here implied. That every content of consciousness which exists or can be conceived has an essential element of both members of the antithesis is exactly what I mean. To illustrate, even the axioms, postulates, or whatever else may be counted as most ultimate in mathematics contain an element of the outer, or objective, as well as of the inner, or subjective. These mathematical contents of consciousness I single out to illustrate my meaning because they have been clung to by philosophers and scientists more tenaciously than any others as purely subjective or mental. And further there is a strategic gain in this reference to mathematics in that it brings into the open the fundamental opposition of my hypothesis to one main root of Cartesian philosophy; the philosophy, that is, from which the modern doctrine of psycho-physical parallelism has grown. Our thinking, which Descartes held proves our existence, really proves it only in so far as it shows that among the activities essential to the



human organism thinking is one. In other words the "therefore" in "I think, therefore I am," is true only because "I am, therefore I think," the reverse proposition, is also true and includes the other truth. The lesser truth is true because it is an essential part of the larger truth, much in the same way that the cells of a multicellular organism are alive because they are essential parts of the organism.

We need not inquire how, from this serious shortcoming of Descartes' description of psychic life Descartes went on to the conclusion that "there is nothing really existing apart from our thought" and that "neither extension, nor figure, nor local motion, nor anything similar that can be attributed to body, pertains to our nature, and nothing save thought alone; and, consequently, that the notion we have of our mind precedes that of any corporeal thing, and is more certain, seeing we still doubt whether there is any body in existence, while we readily perceive that we think." <sup>6</sup> Nor need we concern ourselves with the voluminous and tedious reasonings by which a considerable number of moderns, following Descartes's lead, have convinced themselves that they have "reduced" all reality or at least all reality that really amounts to anything, to quantity. Enough now to remark that every modern biologist who really accepts the basal data of his science, must agree that "Psycho-physical paralellism . . . stands to-day as the scandalous but irrefutable consequence of postulating a material world without qualities and a world of minds that lack spatiality and exists—*nowhere*." <sup>7</sup> One way of characterizing my hypothesis would be to say that it is an effort to remove this scandal by showing where-in the postulation noted by Dr. Montague is not true.

The genetic relationships of my hypothesis can be still farther indicated by coming on down from Descartes to Hume then from Hume to Huxley and finally to G. F. Stout and John Dewey as philosophers of to-day. Hume's nomenclature for the subjective and objective sides of man's

psychic life is "Relations of Ideas" for the first, and "Matters of Fact" for the second. Of the first kind says Hume, "Are the sciences of Geometry, Algebra and Arithmetic; and in short, every affirmation which is intuitively or demonstratively certain." . . . "*That three times five is equal to half of thirty,*" is a simple illustration of the relation of ideas. And, "Propositions of this kind are discoverable by the mere operation of thought, without dependence on what is anywhere existent in the universe."<sup>8</sup> And further on, Part 2, same section, we read: "It must certainly be allowed, that nature has kept us at a great distance from all her secrets, and has afforded us only the knowledge of a few superficial qualities of objects; while she conceals from us those powers and principles on which the influence of those objects entirely depends." Then Hume goes into a discussion of the operations and relations of the "superficial qualities" and "secret" powers of objects which is so similar to my treatment of the relation of the organism to the attributes of certain objects (chapters 20 and 21 this book, and, more particularly, my essay *Is Nature Infinite?*<sup>9</sup>) that it seems as though his words must have been in my mind when I thought out what I have there written, though I certainly was not conscious of Hume's views. And this subconscious influence appears the more probable in that I have almost conclusive proof of having read his argument not long before my own was written. I am certain, however, that if his statements were in my mind they were only in its pre-conscious part and were not nor ever had been in its full-conscious part. In other words, if I had read his words I had not grasped their full significance. This probable instance of the "sub-" or "pro"-conscious I refer to not so much because of its interest in this instance, as because of its bearing on my conception of the nature of consciousness. The discussion by Hume to which I refer is that in which he talks about the sensible qualities and the "secret powers"

of the bread we eat. "Our senses inform us of the color, weight, and consistence of the bread," he says, "but neither sense nor reason can ever inform us of those qualities which fit it for the nourishment and support of a human body." The particular puzzle upon which Hume comes in this matter is the fact that although the examination here and now of a natural object gives us absolutely no clue as to what latent attributes ("secret powers," he calls them) the object may possess, when we examine a second object of the same kind we assume that the same secret powers are possessed by the second object. "If a body of like colour and consistence with that bread, which we have formerly eat, be presented to us, we make no scruple of repeating the experiment, and foresee, with certainty, like nourishment and support. Now this is a process of the mind, of thought," Hume goes on to say, "of which I would willingly know the foundation." "The bread," he says, a little farther on, "which formerly I eat, nourished me; that is, a body of such sensible qualities was, at that time, endued with such secret powers: but does it follow that other bread must also nourish me at another time, and that like sensible qualities must always be attended with like secret powers? The consequences seem nowise necessary. At least, it must be acknowledged that there is here a consequence drawn by the mind; that there is a certain step taken; a process of thought, and an inference, which wants to be explained." Then after a little further argument to show the necessity of recognizing such a process we find this to me exceedingly interesting passage: "There is required a medium, which may enable the mind to draw such an inference, if indeed it be drawn by reasoning and argument. What that medium is, I must confess, passes my comprehension; and it is incumbent on those to produce it, who assert that it really exists, and is the origin of all our conclusions concerning matter of fact."

The great merit here shown by Hume is his ability to push

the analysis of his problem to the very limit of the positive information he had to go on, recognise exactly wherein his information was lacking, and then stop without running off into a purely speculative substitute for his deficient knowledge. According to my hypothesis the unknown "medium" which he saw must exist, the researches of a century and a half since he wrote, in chemistry, physiology, general zoology and botany, and psychology, have enabled us to see is the individual animal organism reaching with the respiratory substance (oxygen?) it takes in. In this one particular and, from the standpoint to which we have been accustomed, very peculiar case, the reaction is at one and the same time part of the essence of both ideas and impressions in the Humean sense, the reaction being the "medium" or the "certain step" by which the inference is drawn, this inferring being possible because of the continuity of the organism as a person, or self, and the persistence of the respiratory substance as the same identical thing from the past through the present into the future.

We will now notice how Huxley, because of his much more extensive knowledge of the structure and function of animals than Hume possessed, was able to draw still closer than Hume could to the heart of the old Mind-Body puzzle. The gist of Huxley's position on, and contribution to, the problem can conveniently be presented through his remarks on the question of innateness of various aspects of psychic life, these remarks occurring in his essay on Hume. After pointing out that neither Locke nor Hume seemed to know exactly what Descartes, the originator of the modern conception of innate ideas, meant by his phrase "*idées naturelles*," Huxley quotes Descartes as follows: "I have used this term in the same sense as when we say that generosity is innate in certain families; or that certain maladies such as gout or gravel, are innate in others; not that children born in these families are troubled with such diseases in their mother's

womb; but because they are born with the disposition or faculty of contracting them.”<sup>10</sup> Then after further quotations to the same effect Huxley writes: “Whoever denies what is, in fact, an inconceivable proposition, that sensations pass, as such, from the external world into the mind, must admit the conclusion here laid down by Descartes, that, strictly speaking, sensations, and *à fortiori*, all the other contents of the mind, are innate. Or, to state the matter in accordance with views previously expounded, that they are products of the inherent properties of the thinking organ, in which they lie potentially, before they are called into existence by their appropriate causes.”

The upshot of this clearly is that innate for Descartes and Huxley means hardly anything else than hereditary, as applied to the psychical as well as to the physical attributes of animals. The ample justification in our day of the view that psychical attributes are hereditary should, it would seem, restore to full standing in biology, the conception of innate ideas—only, of course, in a very different sense from that into which later Idealists have perverted it.

It is in this discussion that Huxley makes one of the most direct and unanswerable arguments against materialism that can be made: “The more completely the materialistic position is admitted, the easier it is to show that the idealistic position is unassailable, if the idealist confines himself within the limits of positive knowledge.”<sup>11</sup> That is to say, if the materialist insists that all traces of innateness of ideas and other contents of the mind must be repudiated, he virtually contends that heredity of whatever sort, whether of physical or psychical attributes, must be repudiated. With this conception of innateness in the entire psychic aspect of the organism before him Huxley asks: “What is meant by experience?”

“It is the conversion,” he replies, “by unknown causes, of these innate potentialities into actual experiences.”<sup>12</sup> Now

these "unknown causes" are, according to my view, essentially the same as the "medium" which Hume recognized must exist for making the "step" possible from the "superficial qualities" to the "secret powers" of natural objects and from the "secret powers" of one object to those of another. They are, to repeat, the reaction of the organism in its latently psychical aspect, with "the breath of life," that is, with the oxygen, or whatever be the gaseous constituent of the air which is active in respiration. And I believe we can see to a considerable extent why Huxley considered these causes as wholly unknown. It was because physiology and bio-chemistry in his day were not yet able to view the organism from the standpoint of physical chemistry. Because of this inability Huxley nor any other physiologist of his period had an adequate structural ground-work for thinking organismally about living things. They were consequently obliged, really, to think of all psychic phenomena, and consciousness with the rest, as being restricted to the nervous system. That such was Huxley's view at any rate, we know from his own words: "No one who is cognisant of the facts of the case nowadays doubts," he writes, "that the roots of psychology lie in the physiology of the nervous system." The important revision of this statement which our hypothesis calls for is that while the roots of psychology are indeed in the nervous system they are by no means in that system alone. They pass through it to a much deeper level, so to speak, and in passing draw great nutriment from it.

In a brief but important paper starting off with the proposition that a philosopher can not legitimately question the existence of the external world—that all he can rightly do is to inquire what that world is and how we can know it at all, G. F. Stout comes to the kernel of the problem in considerably the same way that Hume and Huxley came to it. "For primitive consciousness and for our own unreflective consciousness," he says, "sense experience and the correlative

agency which conditions it coalesce in one unanalysed total object. They coalesce in such a way that the sense-presentation appears as possessing the independence of the not-self, and the independent not-self seems to be given with the same immediacy as the sense-presentation." And, "this complex but unanalysed cognition," Stout continues, "is the germ from which our detailed knowledge of matter develops."<sup>13</sup> If proved true my hypothesis would be a considerable forward step, I believe, in analysing this "unanalysed cognition." For although Stout's assertion "the independent not-self is not matter" seems at first sight to exclude oxygen or any other constituent of our breath from such a place in the external world of his conception as that which it has in that world according to my conception this exclusion is, I think, only seemingly so, for a sentence farther on the author says matter "essentially includes the qualification of the independent not-self by the content of sense-experience." The seeming discrepancy is probably due to the generality of the term matter. I too would say that the "independent not-self" is not matter were I to mean by matter the total substance of the external world. But in the sense that the effective respiratory gas (oxygen supposedly) is matter, my hypothesis would require me to hold that the not-self has an essential material component, which component is really the attribute of the gas in virtue of which it reacts with the organism in the peculiar way it does to produce consciousness. It seems to me that what Stout seeks in the "qualification of the independent not-self by the content of sense-experience" is the *immediately* consciousness-producing attribute of the respiratory gas. We might state the point this way: Oxygen (or the effective respiratory gas) has a double status in human consciousness. First and most fundamentally, it has the status of an immediate and essential participant in producing all consciousness whatever; and second it has the status of an indirect participant in producing the par-

ticular consciousness which we call observational knowledge of the gas. Our knowledge of this one gas is due to two things, (1) to our reaction to it through our sense organs in the usual psychological meaning of react; and (2) to our reaction with it through the protoplasmic basis of all consciousness, reaction in this case having the meaning which chemistry has given the word. What the relation is between the attributes of the gas in virtue of which it reacts with the organism in these two ways, and also what the relation is between the attributes of the organism in virtue of which it reacts with the gas in these two ways, are questions with which a theory of knowledge would deal but which lies outside of the scope of this sketch, which, as has already been said, restricts itself to a theory of consciousness. I may, however, refer in passing to the fact that chemistry appears to be all at sea on the problem of the relation between the chemical and the physical attributes of all substances whatever; so the difficulties about oxygen in this one particular are not an unshared difficulty.

Finally, to bring this exposition of the historical setting of my hypothesis down to the present hour, I call attention to the way the hypothesis connects with the best that formal philosophy in our own day has done, or as I suspect is competent to do, towards making out what "experience" is. No philosopher with whom I have met has gone farther in this direction than John Dewey. In his recent essay, *A Recovery of Philosophy*, we read: "Dialectic developments of the notion of self-preservation, of the *conatus essendi*, often ignore all the important facts of the actual process. They argue as if self-control, self-development, went on directly as a sort of unrolling push from within. *But life endures only in virtue of the support of the environment.*"<sup>14</sup> The italics are mine and mark the most vital part of the quotation for us. And a page farther on: "Experience is no slipping along in a path fixed by inner consciousness. Private con-



consciousness is an incidental outcome of experience of a vitally objective sort; it is not its source. Undergoing, however, is never mere passivity. The most patient patient is more than a receptor. *He is also an agent—a reactor.* . . . Again the italics are mine. I take the liberty to end the quotation at “reactor” though the remaining part of the sentence is important for Dewey’s particular purpose. But my aim is different. I want to fix attention on the two statements italicised for the purpose of showing how my hypothesis connects with Dewey’s general conception of experience. When Dewey says life endures only as supported by the environment, he is speaking in very general terms, having reference, I imagine, more to social and other bulk aspects of environment. My hypothesis, on the contrary, makes the dependence of life on environment exceedingly specific in that it undertakes to show the particular thing in the environment, namely, the respiratory part of the atmosphere, which is physiologically basal to self-development and self-preservation. The Self which traditional philosophy has struggled so hard to understand is literally, the human organism, according to my hypothesis. And when in this discussion I speak of it as reacting with the respiratory air to produce consciousness, I am using the verb to react in a very specific, physico-chemico-biological sense, while Dewey is using it in a general sense, and explicitly at least, with only a psychological implication.

The “self” which I am suggesting does indeed imply “another” no less unequivocally than does the “self” of advanced social psychology. But the “self” and the “other” implied by my hypothesis differ from those of current philosophical theory in that the roots of both are not only in the social relationships of the human species, but extend right on through these into sub-human relationships, even down into the very constitution of inorganic nature. The “self” and the “other” of my conception are more personally

objective, and more cosmic in their affinities, than are the "self" and the "other" of social psychology.

Continuing now with our examination of the foundation of my hypothesis I find it convenient, especially because of my reference a few pages back, to Huxley's unanswerable contention for an essence of truth in both materialism and idealism, to call attention to a natural history fact in the higher mental life of man which I take to be a strong confirmation of the contention. This fact concerns the general difference between what are commonly known as the materialistic and the idealistic attitudes of mind. This difference comes, I believe, to the same thing finally, as the difference between the objective and subjective attitudes, and is also the difference, at bottom, between what in rather loose though prevalent expression, is called the difference between the scientific and the philosophic attitudes. It would seem that the philosopher who declares himself to be an Absolute Idealist, as Royce does, is under heavy obligation, especially if he enters the field of psychology, to explain the fact that the originators of great interpretative ideas of nature have invariably recognized that their hypotheses must be "proved"; that is, that the subjective experience which constitutes the hypothesis must be found to have its counterpart in the external world of sense. If "Reason creates the world," even in the recondite meaning of Royce's philosophy, how happened it that Newton should have been so "restless" for evidence of an objective, an external counterpart to the subjective result he had reached by mathematical reasoning, that he held back his reasoned creation for sixteen years, waiting for the proof, the sense-perceptual or at least the sense-perceptible experience, that should round out his reasoned truth? May not, I ask, the very kernel of the difference between science at its best and philosophy at its best be in this, that the typical scientist is somewhat deficient in "restlessness," adopting Royce's terminology, for internal or sub-

jective reality; while the philosopher of the schools is somewhat deficient in restlessness for external or objective reality? We could say with almost literal chemical accuracy that the curiosity and eagerness of the naturalist for yet unobserved objective truth is due to an unsatisfied affinity which is weak, or in some instances, wholly lacking, in the subjective idealist.

The facts which seem to justify our chemico-organismal hypothesis of conscious psychic life, seem also to imply a complete interpenetration of objective science and idealistic philosophy.

### *As to the Lowest Terms of Self-Consciousness*

Let us now veer our course in examining self-conscious life, and see what can be made out about its roots and rootlets instead of about its fruitage.

We are often reminded that our knowledge about our internal organs, our heart, liver, lungs, et cetera, comes only through observations by the anatomist and physiologist; that we are quite unconscious of these organs in our own bodies, especially if they are working normally. Now I point out that to be perceptually conscious of a liver, let us say, as a specialized morphological entity performing its appropriate functions, is a very different matter from being conscious of those primal, undifferentiated processes which are basal to life itself, and so are common to all the tissues whether liver, muscle, brain, or what not, so long as they are actually living. That that which is truly organic, in the sense of pertaining to the fully constituted organism, must be regarded from this standpoint as well as from the standpoint of their final state of differentiation, is one of the common-places of modern biology. Let a person in as nearly perfect health as he ever experiences, do his best to eliminate all external and internal stimuli of his specialized sensory parts; also all remembering, all feeling of the usual

kind, all imagining, and all thinking. Then let him answer the question: How do I know I am alive? An undertaking of this sort is wholly introspective in the sense of being such that each person must engage in it for himself alone. He can not show his results to anybody else. A good bit of ingenuity may be exercised on it and the outcome will be found to be rather surprising if not very conclusive as to the purpose for which the experiment was tried. But the results as reported may be of some value. Personally, I believe I can follow my consciousness down to where I can recognize its most basal remaining "content" to be an awareness of what I may call extension without definite limitations. It seems to me I can detect something to which I could not, from its nature alone, apply the terms "I" or "me" as something differentiated from everything else. Possibly what I note is wholly fanciful, but I seem to feel myself in about the condition of psychical life which I imagine a star fish is in.

Of course I realize how far such a statement is from being purified of all thought and other ordinary mental elements. Nevertheless, I believe it to be of some value as evidence that consciousness is an attribute of the organism as a whole, and can neither be held to contain an element which can exist separately from the organism, nor be restricted to any particular part of the organism as the brain or the nervous system. There seems to be *some* evidence "directly felt by us ourselves," and that evidence points to this conclusion as to the nature and "seat" of consciousness. The point is susceptible, I am quite sure, of rather rigid experimental examination. However, the further experiments which have suggested themselves to me involve difficulties more formidable than I have thus far been in position to attempt.

The reader acquainted with James's notable Chapter X, "The Consciousness of Self" (*The Principles of Psychology*, Vol. 1) will recognize the difference between such introspec-

tive experimentation as that here indicated, and that so illuminatingly described by James as tried on himself. While James's undertaking was to give an account of the *thought and other processes* in consciousness as he could observe them in himself, what I want to accomplish requires me to get rid of, to ignore as far as possible, the very things which James was studying. (I want to find whether any "content of consciousness" remains after thought and the other usual mental contents are out of the reckoning.) I believe, however, that James opens the way to such an hypothesis as mine. Thus in a footnote we read, "The sense of my bodily existence, however obscurely recognized as such, *may* then be the absolute original of my conscious selfhood, the fundamental perception that *I am*. All appropriations *may* be made to it *by* a Thought not at the moment immediately cognized by itself. Whether these are not only logical possibilities but actual facts is something not yet dogmatically decided in the text." <sup>15</sup>

Except for a little misgiving arising from uncertainty as to the exact meaning of "Thought" in this quotation, I believe my hypothesis does what James says his text leaves undecided.

This foot-note of James's may serve as a switch key to shift the current of our discussion from the psycho-conscious phase of life through the psycho-physical to the purely physico-chemical phase. The course along which this shifting will run can be designated thus: full-fledged intellect (already examined), instinct, emotion, bio-physico-chemical organization.

### *Instinct and Physical Organization*

The discussion from which we have just turned of the relation between "inner" and "outer," between "subjective" and "objective," must be regarded as meeting the require-

ments of this sketch so far as the first member of the series is concerned; and the relation between instinct and physical organization will now receive attention. The evidence of vital connection here is so abundant and clear-cut, and the views of competent observers are so unanimous that the subject can be disposed of quite summarily. Probably the most indubitable single block of evidence comes from nest-building and cocoon-spinning insects. Many of the facts from this field have been so much exploited for the very purposes to which we now invoke them that a few quotations from and remarks upon the writings of naturalists generally acknowledged for learning and judicious thinking will suffice.

We turn first to W. M. Wheeler, and take to begin with, words which he in turn quotes from Bergson: "As Bergson says," we read, "It has often been remarked that most instincts are the prolongation, or better, the achievement, of the work of organization itself. Where does the activity of instinct begin? Where does that of nature end? It is impossible to say. In the metamorphoses of the larva into the nymph and into the perfect insect, metamorphoses which often require appropriate adaptations and a kind of initiative on the part of the larva, there is no sharp line of demarcation between the instinct of the animal and the organizing work of the living matter. It is immaterial whether we say that instinct organizes the instruments which it is going to use, or that the organization prolongs itself into the instinct by which it is to be used.'" And Wheeler continues: "The spinning of the cocoon by the larval ant is a good example of the kind of instinct to which Bergson refers. From one point of view this is merely an act of development, and the cocoon, or result of the secretive activity of the sericteries and of the spinning movements of the larva, is a protective envelope. But an envelope with the same protective function may be produced by other insect larvæ simply as a thick, chitinous secretion from the whole outer surface of the

hypodermis. Here, too, we have an activity which, though manifested in a very different way, is even more clearly one of growth and development. And when the workers of *Ecophylla* or *Polyrhachis* use their larvæ for weaving the silken envelope of the nest, as described in Chapter XIII, we have a further extension and modification of the cocoon-spinning activities. In this case the spinning powers of the larva are utilized for the purpose of producing an envelope, not for its individual self, but for the whole colony. In conventional works this latter activity would be assigned a prominent place as a typical instinct, the spinning of the cocoon might also be included under this head, but the formation of the puparium, or pupal skin, would be excluded as a purely physiological or developmental process, yet this last, no less than the two other cases, has all the fundamental characteristics of an instinct." <sup>16</sup>

Then immediately follows this statement, especially significant for the proposition of our hypothesis which assigns to the individual organism the chemical value of an elementary substance: "Viewed in this light there is nothing surprising about the complexity and relative fixity of an instinct, for it is inseparably correlated with the structural organization, and in this we have long been familiar, both with the dependence of the complexity and fixity of parts on heredity and the modifiability of these parts during the life-cycle of the individual. Fixed or instinctive behavior has its counterpart in inherited morphological structure as does modifiable, or plastic, behavior in well-known ontogenetic and functional changes."

The statement that surprise is largely taken away from such elaborate manifestations of instinct as those here depicted, by recognizing that the instincts are "inseparably correlated with structural organization" and have their "counterpart in inherited morphological structure," will, no doubt, receive the assent of most zoologists, as will also the

statement that our long familiarity with structural organization and morphological inheritance is what makes us regard these without surprise, and, by inference, as comprehensible. It is not that the corporeal form and structure of the worker ants and of the larvæ which they manipulate as spinning instruments and shuttles for making the nest, are necessarily simpler and, on that account, more comprehensible than are the instinctive acts of the workers, but that during our whole lives we have been familiar with structure, and ourselves exist as "structural organizations." This is equivalent to saying that we have always been not only learning but directly experiencing interdependences and correlations among the common body-parts and body-acts, and so regard them as comprehensible, as explicable. To comprehend really an external complex of structures and activities is to live the counterpart of it. To understand such a complex scientifically is to understand it through a course of observation and reasoning; that is, rationally. To explain such a complex is to bring in, or recognize consciously one by one the constituent elements of the complex, and recognize all these as parts of the *ensemble*. It is to recognize the elements in both their isolate and integrate capacities.

So much for the evidence of integration between instinct and physical organization as presented by one carefully philosophical naturalist. Several other naturalists have gone nearly as far, but this single instance is so typical and conclusive as to the objective facts that it will suffice. In commenting on the significance of being surprised at such rarely witnessed performances as those furnished by these ants, while we are not surprised at common structures and acts of equal or greater complexity furnished by more familiar animals and by ourselves, I go beyond, though only a little beyond Wheeler.

The only other zoologist to whom I turn for evidence of vital relation between instinct and structure is C. O. Whit-



man. His testimony supplements Wheeler's in that it is more exclusively and radically objective than is Wheeler's; that is, it verges less toward the subjective-type of presentation and draws nearer to the bio-chemical ground work. Although Whitman wrote relatively little on animal behavior, that little seems to me to contain some of the most important observations and conclusions which have been produced in this branch of zoology. What I utilize is taken from his address *Animal Behavior*. The animals upon which Whitman's chief studies were made were leeches of the genus *Clepsine*; a salamander (*Necturus*); and pigeons of several species. Our purpose will be best served by quoting a few sentences which go direct to the heart of the question in hand, that namely of the vital connection of instinct and basal physical structure. "The view here taken," Whitman writes, "places the primary roots of instinct in the constitutional activities of protoplasm and regards instinct in every stage of its evolution as action depending essentially upon organization."<sup>17</sup> Then, apparently to clarify and emphasize the last clause about the dependence of instinct or organization, he adds a footnote thus: "Professor Loeb refers instinct back to '(1) polar differences in the chemical constitution in the egg substance, and (2) the presence of such substances in the egg as determine heliotropic, chemotropic, stereotropic, and similar phenomena of irritability.' According to this view, the power to respond to stimuli lies in unorganized chemical substances, and the same powers exist in the adult as in the egg, because the same chemical substances are present. Organization serves at all stages merely as a mechanical means of giving definite directions to responses.

"The view I have taken regards instinctive action as *organic* action, whatever be the stage of manifestation. The egg differs from the adult in having an organization of a very simple primary order, and correspondingly simple powers of response. Instinct and organization are, to me, two

aspects of one and the same thing, hence both have ontogenetic and phylogenetic development."

These statements show, as do those given in our discussion of the cell-theory, how far Whitman went away from full-fledged elementalism and toward organismalism. But his treatment of instinct and animal behavior reveals what his treatment of the cell-theory does not, at least so clearly; namely, how far he also went on the way to the natural history mode as contrasted with the mechanistic mode of philosophizing on biological phenomena. And this gives me a pleasant opportunity to testify to the genuinely naturalist current that ran through his life and work. An unforgettable visit which I had with him among his pigeons not long before he died, permitted me to see something of the character and depth of his interest in those animals. His whole attitude toward them—his wonderfully broad information about, and understanding of their general ways of life and personal idiosyncrasies, his solicitude for them, and his measured affection for them—was such as is never displayed by any one who has not very much of the real naturalist about him, in his personality as well as in his knowledge. The individual pigeons, many of them at any rate, appeared to be realities to him in a deep sense and not merely "mechanical means for giving definite directions to responses" of chemical substances. But after all this is said, it must also be said that there is no evidence that Whitman ever grasped fully the conception that the "constitutional activities of protoplasm" in which he believed instincts to be rooted, must be the constitutional activities of *protoplasms* (protoplasm in the plural number), because no individual pigeon is either any other individual nor even exactly like any other; and also that the existence of protoplasms is dependent upon the organisms to which they belong as well as upon the chemical substances of which they are composed. Whitman went so far on the road toward organismalism as to believe genuinely in the

*organic* and *organisation*, but not far enough to make him accept unreservedly *individual organisms*.

We are able to state definitely wherein lies the great and rather unique merit of Whitman's investigations on animal behavior. (1) By a judicious combination of pure observation and observation aided by experiment and conception, he pushed psychic phenomena in the form of instinct down almost to the physico-chemical level; that is, to the protoplasmic level. (2) He at the same time remained positively within the organic, the living realm. His merit is that of restraint as well as of positive achievement. He did not permit his enthusiasm for physical explanation to betray him into adopting a phraseology which, while *sounding* like an explanation of instinct, amounts in reality to a *denial* or a *repudiation* of it.

So much for the evidence of vital connection between instinct and organization. According to the schedule indicated a few pages back for reviewing systematically this connection through the entire range of psychic life, we have next to glance at the connection between the emotions and organization.

### *Emotion and Physical Organization*

Approaching this subject as we now are from the direction of psychology proper, the well-known James-Lange interpretation of emotion comes immediately to mind. It will be advantageous for our sketch not to focus attention too closely on any theory or discussion but to take in as much as we can of the entire field, keeping in the foreground our own personal experiences and observations as contrasted with the descriptions and views of authorities. What I mean is that the reader shall take himself in hand for serious study as to his emotional life, watching himself from hour to hour, day to day, and year to year under all the varied conditions,

happenings, purposes, and impulses to which he is subject. In doing this a special point should be made of looking back scrutinizingly at experiences of particular satisfaction, elation, joy, sorrow, irritation, anger, fear, dread, humiliation, and shame, as soon after their occurrence as possible that they may be fresh in memory. But incidents and episodes of one's remoter past which stand out with special vividness from the intensity of the particular emotions when they were experienced, or because of results which flowed from them, will be found illuminating.

To what extent and in what particular fashion was our *bodily organization* implicated in the feelings and emotions we experienced, is our problem. Fortunately one can "live over again" as we say; can "work himself into" rather pronounced emotional states, through a combination of memory and imagination. That is, he can be much of a genuine dramatist when all alone, as touching events and scenes of his own past experience. What happens to your body when you do that sort of thing? is the central question before us. The very criterion by which you answer this question you will find will be that of how far the body-manifestations appropriate to the particular emotions are elicited through your efforts. If your hands do not clinch somewhat, if many of your arm, leg, and abdominal muscles do not contract somewhat, if your respiration does not quicken somewhat, and other manifestations, various corporeal indices of anger, do not appear quite independently of direct intention on your part, you will be sure you have not "worked up" a genuine state of anger. The only *real* knowledge of an emotion is a *lived* knowledge of that emotion. In order to be a true actor your body parts must *act*, directly, automatically, spontaneously, so far as any rational purpose is concerned. And what is true of anger is clearly true of all other emotions.

Our emotional activities may be described as instinctive and reflex activities, the feeling-impulse of which comes

*through* intelligence, but is not *of* intelligence—is not under the direct guidance and control of intelligence. According to this interpretation no animal, no matter how highly constituted as to instincts and reflexes, could have emotion unless it had intelligence. Emotional activity is instinctive and reflex activity of an intelligent organism, with, however, the element of intellect eliminated or in abeyance for the time being as regards these particular acts. This is what I would call the natural history description of emotion. And I believe it is in essential accord with James's conception of emotion, but his description is a psycho-physiological rather than a natural history description. I am quite sure that what I have just said means virtually the same as the following: "*If we fancy some strong emotion, and then try to abstract from our consciousness of it all the feelings of its bodily symptoms, we find we have nothing left behind, no 'mind-stuff' out of which the emotion can be constituted, and that a cold and neutral state of intellectual perception is all that remains.*"<sup>18</sup>

I will now point out wherein I believe the natural history description and interpretation of emotion are somewhat truer and better than those given by James and other physiological psychologists—and, I may add—very much truer and better than those given by certain writers who approach the subject from the physiological side pure and simple. James's epigrammatic statements about being afraid because we tremble when we meet a bear in the woods; about being sorry because we cry; about being angry because we strike, do his own position some injustice, I think. This is an instance in which his gift for piquant writing succeeded too well. But the fact ought to be noticed that what he actually says is that as between the usual statement, namely, that we tremble because we are afraid, cry because we are sorry, strike because we are angry, and his way of stating the case, his way is "more rational." It is only relative, not absolute truth, he

is aiming at in these statements. Nevertheless, after due allowance is made for an expressional miscue to some extent, there is yet substantial defect in his presentation. Speaking in general terms, the defectiveness is not so much in the antithesis set up as in the restrictedness implied. Or, bringing the criticism around toward our particular standpoint, the statement falls short of being organismal.

W. B. Cannon has, I believe, indicated the direction in which the adequate statement lies. He writes: "We do not 'feel sorry because we cry,' as James contended, but we cry because when we are sorry or overjoyed or violently angry or full of tender affection—when any one of these diverse emotional states is present—there are nervous discharges by sympathetic channels to various viscera, including the lachrymal glands. In terror and rage and intense elation, for example, the responses in the viscera seem too uniform to offer a satisfactory means of distinguishing states which, in man at least, are very different in subjective quality. For this reason I am inclined to urge that the visceral changes merely contribute to an emotional complex more or less indefinite, but still pertinent, feelings of disturbance in organs of which we are not usually conscious."<sup>19</sup> What Cannon's criticism amounts to, expressed in other language is: while freely granting that organs and functions in the usual physiological sense play an essential part in emotion, neither the visceral nor any other single set of organs is sufficient to account for the whole of *any* emotion. Visceral changes contribute to the "emotional complex," but the real source of the feelings involved is embedded elsewhere and more broadly in the organization. Cannon suggests: "the natural response is a *pattern reaction*, like inborn reflexes of low order." "The typical facial and bodily expressions," he writes, "automatically assumed in different emotions, indicate discharge of peculiar groupings of neurones in the several affective states."

Without stopping to examine this language in detail, our

aim will be achieved by pointing out that the more closely the various emotions are scrutinized, and the more effort there is made to refer them to their causes, the more varied are they found to be, and the more widely are we led to search in the organization for causal factors. The mental attitude of perfect openness toward any and all facts, both of effect and cause, which may occur in a given organic situation, is one of the leading characterizations of the organismal conception. The assertion that the organism as a whole is the causal explanation of an emotion or an "emotion complex" is justified by two considerations: (1) Except for the organism viewed alive and whole and under both its ontogenic and phylogenic aspects, the emotion would not exist; and (2) so wide-spread and subtle does common observation recognize the parts of the organism involved to be in many of its emotional activities that for practical purposes, it is better to work on the hypothesis that *all* parts of the organism are implicated than to adopt the alternative hypothesis that certain parts *only* are involved; that is, that some parts are *not* involved.

As a matter of fact, I believe that in spirit James' hypothesis is organismal even though, probably from his training and career in formal anatomy, physiology, and psychology, he never became entirely free from the Body-Soul antithesis and the dogmatisms of "nerve physiology," which have so dominated modern physiology and psychology. This opinion I base on the general tenor of his discussions particularly of the emotions, rather than on his direct formulation of his theory of emotion. I will quote a few passages that seem particularly to trend in this direction. "No reader of the last two chapters [*The Production of Movement, and Instinct*] will be inclined to doubt the fact that *objects do excite bodily changes* by a preorganized mechanism, or the farther fact that *the changes are so indefinitely numerous and subtle that the entire organism may be called a sounding-board*, which every change of consciousness, however

slight, may make reverberate. The various permutations and combinations of which these organic activities are susceptible make it abstractly possible that no shade of emotion, however slight, should be without a bodily reverberation as unique, when taken in its totality, as is the mental mood itself. The immense number of parts modified in each emotion is what makes it so difficult for us to reproduce in cold blood the total and integral expression of any one of them. We may catch the trick with the voluntary muscles, but fail with the skin, glands, heart, and other viscera." <sup>20</sup> I ask the reader to make special note of the part of the quotation beginning, "The various permutations" as we shall have more to say about it a few pages farther on.

Again we read: "Our whole cubic capacity is sensibly alive; and each morsel of it contributes its pulsations of feeling, dim or sharp, pleasant, painful, or dubious, to that sense of personality that every one of us unfamiliarly carries with him. It is surprising what little items give accent to these complexes of sensibility." <sup>21</sup> I hope the reader will notice how easy it would be for me to contend that these statements come near to my statement about "inner" and "outer," or subjective and objective; and also to my formal hypothesis as to the nature of consciousness. However, I do not wish to make too much of such a contention, though I shall bring up the point again presently. All I want to do just here is to make still clearer the meaning of my view that James was organismal in spirit, though not wholly so in formal statement. To me one of the strongest evidences of this was his obvious effort, as indicated by these and many other passages in many other writings than his *Psychology*, to *describe fully* the phenomena with which he chanced to deal. As I have remarked in substance so many times in this book, one of the most unmistakable signs of the elementalist attitude in biology is incomplete and more or less perverted



description. And nowhere, perhaps, in the whole biological realm is there a better chance for description of the genuinely natural history, organismal kind—the kind a cardinal motto of which is “neglect nothing,” than in this very field of human emotions, especially of one’s *own* emotions. Nor can I refrain from reminding the reader that one of the master works in this field is Darwin’s *The Expression of the Emotions in Man and Animals*, and that while a leading motive of its author was to interpret the emotions in accordance with the theory of descent and the natural selection hypothesis, probably the most lasting value of the work is from its fullness and excellence as a natural history description of the emotions and their objective expression.

As to the fact of vital interdependence between psychic life and physical life through the emotions, personal experience and observation, backed up and supplemented by many authoritative writings, among which those of Darwin and James stand out strongly, there seems no longer any room for question. The rôle of the emotions as between “Body” and “Soul” may be crudely likened to the splice which a skillful sailor weaves into two pieces of rope in joining them so that there shall be no knot and as great strength as in any other part of the rope. In the recent period of psychology—of so-called physiological psychology—we have frequently heard about psychology “without a Soul;” and such an idea has seemed repugnant to many persons. But if we could show that this modern psychology is “without a Body” by the same token that it is “without a Soul,” the legitimate misgivings about the soullessness of the psychology ought to be allayed. And really the organismal conception of psychic life is seen, especially when we examine it in the phase of the emotions, to amount to such a composition of the Body-Soul antithesis. “Body” we can see, as it figured in the old psychology, virtually signified what we usually mean by corpse,

or cadaver. "The Body," in that sense was not alive at all. It was not alive because all the life was taken out of it (by the theoretical antithesis) and put into "The Soul."

*Glance at the Equilibrative Interaction Between "Body" and "Soul"*

Going forward from such predominantly observational descriptions of psychic life in its emotional phase as those of Darwin and James, to such experimental descriptions as those being produced by the investigations of Pawlow, of Crile, and especially of Cannon, we are getting considerable insight into the rationale of how "Body" and "Soul" vitalize each other. Modern researches on the physiology or the psychology (which one calls it depends entirely on the direction of his approach) of psychic life is revealing something of the why and how of the poet's instinctive perception, "Soul needs Body as much as Body needs Soul." Only one aspect of this "why and how" need be noticed in the present discussion. That is the fact of the balancing off of antagonistic emotions to make the normal emotional life just as reflex-actions and instinctive actions are largely phenomena of equilibration, or balancing-off.

It should be recalled that we have found this antagonistic-equilibrative principle to run through the entire neuro-psychic life. In the strictly reflex phase the mode of operation of the opposing muscles, the flexors and extensors of the limbs, as brought out by Sherrington, was cited as a good illustration of the principle. A manifestation of the principle in a broader way, as measured by the extent of organic parts involved, was seen in the relation of the vagal (cranial) and splanchnic (thoracico-lumbar) autonomies, as emphasized by W. B. Cannon (Chap. 19, this book) this illustration being chiefly in the reflex phase. In a yet higher phase we saw, again from Cannon's work, the principle

in operation through the emotions (Chap. 23) thus bringing it up to the phase of lower conscious life.

The reader should not forget the insistence throughout our presentation of these antagonistic phenomena, that always the oppositions and antagonisms and competitions are fundamentally constitutive as to the normal organism. Even the most pronounced of them are yet in the interest of the organism as a whole. They are always partial phenomena relative to the whole organism. They have evolved in strict accordance with and sub-ordination to the fundamental nature of the organism in its totality. The opposing muscles of our limbs can not break or tear one another under normal conditions. Even antagonisms among the parts of the organism are possible because the parts belong to the organism. The antagonisms of the parts do not produce the organism, primarily, but are themselves produced by the organism, or at least, are a portion of the means or methods by which the organism lives and enlarges, develops and functions. All this, be it noticed, holds not merely as touching purely physical organization\* but as to the entire gamut of psychic life, at least up to and including instinctive and emotional life.

#### *Support of the Hypothesis by the Physico-Chemical Conception of the Organism*

This prepares us for the final step of switching the discussion from the psycho-conscious aspect of life to the bio-physico-chemical aspect. The place in our discussion to which this return naturally takes us is that wherein we considered the organism's chemical nature as interpreted by physical chemistry. That interpretation has been presented by several physiologists but with special insight and cogency by F. G. Hopkins. For example, our citation in Chapter 4

\* The discussions of growth and chemico-functional integration, chapters 17, 18, and 19, *The Unity of the Organism* should be read in this connection.

of *The Unity of the Organism*, the statement that the conception of the organism as a chemical laboratory "is rapidly gaining ground," should be recalled, as should also the opinion of Hopkins: "the chemical response of the tissues to the chemical stimulus of foreign substances of simple constitution is of profound biological significance," and that further study of the phenomena "must throw vivid light on the potentialities of the tissue laboratories."<sup>22</sup> So far this chemical laboratory conception of the tissues may be said to be strictly chemical; but let us recall what the interpretation is when it passes from chemistry in the exclusive sense to physical chemistry and becomes more specific as to the laboratory apparatus, as one may say, through which the "tissues" work. In other words, recall the conception of the cell and its mode of operating, as viewed by physical chemistry. The quotations given in Chapter 4 may well be repeated in part: ". . . the living cell as we now know it is not a mass of matter composed of a congregation of like molecules, but a highly differentiated system; the cell in the modern phraseology of physical chemistry, is a system of coexisting phases of different constitutions."<sup>23</sup> Then from this review our own contention, set forth especially in Chapter 7, that wherever in such statements as those just quoted from Hopkins "the term *cell* occurs the term *organism* really ought to be used."

It is important for our cause generally that the full weight of our argument in support of the view that on the strictly physical plane, the *organism* rather than the *cell* is really the equilibration system toward which physico-chemical knowledge is tending, should be in the reader's consciousness. At this point if, consequently, this is not so, he is urged to read what is said on the point in Chapters 4 and 7 especially.

Our central purpose now is to show that the organismal hypothesis of consciousness articulates directly and natur-

ally with the same conception of the organism. Undoubtedly it is in the emotional phase of psychic life that this articulation is most open to common observation. Compare, for example, James' "Our whole cubic capacity is sensibly alive; and each morsel of it contributes its pulsations of feeling, dim or sharp, pleasant, painful, or dubious, to that sense of personality that every one of us unfamiliarly carries with him," with Hopkins' "On ultimate analysis we can scarcely speak at all of living matter in the cell; at any rate, we cannot, without gross misuse of terms, speak of the cell-life as being associated with any one particular type of molecule. Its life is the expression of a particular dynamic equilibrium which obtains in a polyphasic system . . . 'life' as we instinctively define it, is a property of the cell as a whole, because it depends upon the organization of processes, upon the equilibrium displayed by the totality of the coexisting phases." <sup>24</sup> Also compare Hopkins' statement that among the different "phases" of the cell in which its life inheres, "are to be reckoned not only the differentiated parts of the bio-plasm strictly defined (if we can define it strictly), the macro-and-micro-nuclei, nerve fibers, muscle fibers, etc., but the materials which support the cell structure, and which have been termed metaplastic constituents of the cell," with James' "each morsel" of our cubic capacity "contributes its pulsations of feeling, etc."

The congruity of these statements is apparent even when taken as here exhibited; that is, each as standing by itself at about the two extremes of the scale of life. When, however, they are viewed in connection with my general argument that "cell" in Hopkins' statement ought to be replaced by "organism"; and in connection with what we have learned from Cannon and others about the mechanism by means of which the organism operates in the phase of conscious emotion, it seems as though our organismal hypothesis of consciousness comes near to a demonstration. And so far as

ordinary descriptive natural history is concerned, I believe this to be true. However, I recognize, keenly enough, that from the standpoint of bio-chemistry, and physiology, and also from that of philosophy in the traditional sense, that demonstration is not only far away, but is attainable, if at all, only by surmounting very formidable difficulties. So I reassure the dubious reader that all I am claiming is that my two propositions about the nature of consciousness together constitute a legitimate scientific hypothesis.

### *Personality and Elementary Chemical Substances*

With both the physico-chemical aspect and the psychical aspect of our hypothesis now before us more fully and sharply than they have been hitherto we will examine an objection to it which I apprehend will be the most serious the hypothesis will meet; namely that to the proposition that each individual organism has the value in a chemical sense of an elementary substance. And since this objection will probably be more intolerant and stubborn from the side of physics and chemistry than from that of natural history and psychology I will adjust my remarks with reference to the opposition as thus anticipated.

The considerations I am going to present might have been, in strict expository coherence, presented as a part of my discussion of the uniqueness of the individual consciousness as marked by its necessary privacy and its difference from all other individual consciousness. What we are now to emphasize is the fundamentality of objective as contrasted with subjective personality of such highly developed animals as song birds, domesticable animals, and civilized man.

A complete definition of "personality" is not obligatory for our purpose. Only this much need be said about the meaning we shall give the word: First, we deny the right claimed by some authors to make personality purely psy-

chical, or spiritual—a thing of the “inner,” or “deeper” self; “Self” that is, in a thorough-going subjectivistic sense. It is on this ground, as I understand, that some psychologists, as G. F. Stout, and, apparently C. Lloyd Morgan <sup>25</sup> deny personality to animals. All I will say on this question here is that I am quite sure that every close observer of the higher animals will recognize that if he undertakes to give a truly full report of his observations on their behavior he will have to speak of the personality of some at least of them just as he would of the personality of *observed* human beings, or he will be obliged to call the same thing by some other name—a kind of procedure against which we have spoken strongly throughout this volume. For us, whatever personality may be, we must conceive it to be founded upon, and conformable to, the organism. “Organism” must be the more inclusive term. “Person” must stand to “Organism” in the logical relation of species to genus.

Another meaning of personality in this particular discussion will concern the uniqueness of each organism as to its psychical attributes regarded in their totality. By uniqueness I mean not merely the fact that each organism is *itself*, perceptually regarded, but that it is not a replica, a duplicate of any other. It is not only another organism but it is in some measure a *different* other organism. For the benefit of those physical- and metaphysical-minded readers who have never informed themselves much about the facts of natural history and have never tried seriously to think in the natural history manner I would remark that what I have just said concerning the uniqueness of the individual organism is only re-asserting in a more refined way what botany and zoology have recognized more or less definitely since Darwin’s time at least, and have partially expressed in the terms “individual difference” and “individual variation.”

With this we come to the cardinal point: *If individual animal organisms, especially individual humans under civi-*

*lization, be contemplated with due heed to the motto "neglect nothing" the conviction will be reached that each and every one has literally as much of uniqueness about it as has an elementary chemical substance.*

In order to bring out the truth of this statement we must exhibit, in the regular natural history manner, the resemblances and differences between chemical elements on the one hand and the resemblances and differences between human beings on the other, and then pool the results of these comparisons.

To the carrying out of this enterprise the so-called periodic law in chemistry is of very great importance. The essence of this law, stated from the natural history standpoint, is that the chemical elements range themselves into natural species and genera after much the fashion that plants and animals do; and that the classification is based mostly on the chemical attributes of the substances, but partly on their physical attributes also. Thus the group of alkali metals, that to which lithium, sodium, and potassium belong, is a genus in the sense of descriptive natural history, its species being the substances mentioned with others not enumerated. Also the group often spoken of in chemical laboratories as "the iron group"—the genus containing the species iron, cobalt, nickel, platinum, etc., illustrates the point. Two species of the last genus, iron and nickel, will be used in our study. Let us compare some household utensil made of iron with a similar one made of nickel. For the ordinary uses to which these implements would be put the difference between the substances of which they are made would hardly be noticed. The higher specific gravity of nickel (8.5 plus) is so slight as compared with that of iron (7.8) that the greater weight of the nickel implement would probably not be noticed. Nor would the slightly lower melting point of nickel nor its much lower magnetic capacity be recognized. The most available distinguishing difference is in color, the ordinary house-



keeper answering you, if you ask how she knows a nickel from an iron implement, that the nickel piece is silvery bright while the iron piece is black.

See now what this means. Actually, as is well known to every beginning student in analytical chemistry, these two metals are very similar in color as well as in other physical attributes—so much so, in fact, that some authors apply the same term “silver white” to both. What a housekeeper really means when she says she knows one implement to be of nickel because it is bright and the other to be of iron because it is black, is that she is depending on a chemical rather than a physical attribute for a distinguishing mark; the attribute, that is, in virtue of which iron is acted upon much more readily by oxygen in the presence of moisture than is nickel. The much greater liability of iron than nickel to tarnish and rust is a chemical rather than a physical difference between them. This fact, namely that of the dependence of distinguishing differences between substances more upon chemical than upon physical attributes is of very wide applicability in nature, and is greatly important both scientifically and philosophically.

Now turn from comparing these two elementary chemical substances to a comparison of any two human organisms, or persons who might be members of a household to which the implements might belong. And make the comparison first on the basis of the physical attributes just as we began comparing the implements of nickel and iron. Does any reader doubt that he would find it much easier to distinguish the persons than the metals? As to purely morphological, that is, physical differences between almost any two persons (with the possible exception of certain rare instances of “identical” twins), there is no room for question. General shape of head, face and features, and the size and proportions of the various parts of the body furnish many unmistakable distinguishing attributes.

*On the Psychology of Subjective and Objective Personality*

But unerring as are the differentiating marks on the physical side, such marks are few as compared with those on the psychical side. Noting first certain merely physico-psychical differences think of the manners of speech and of hand writing, to mention only two items! Undoubtedly these differences are to a considerable extent physical but no one would seriously question that psychical factors come in all along the line. This is perhaps most obvious in speech as evidenced by voice modulations, intonations, gesticulations, and facial and bodily expressions. Again, differentials are everywhere recognizable in responses to sensory stimuli, especially in the matter of reaction-time. There are the quick and accurate persons, and the quick and inaccurate ones; and there are the slow and accurate and the slow and inaccurate types, to go only a step in description and classification on this basis.

Then we proceed to compare the unequivocal psychical phases of life: the feeling, the emotional, the esthetic, the religious, and the intellectual phases. Here we pass into a realm of what might properly be called objective privacy in psychology, individuals for the study of which would be largely the student's most intimate and most enduring friends and associates, human and animal. Such a psychology would be undeniably so particular and intimate that much of it would be unpublishable even if it had an interest beyond the few persons concerned. At the same time there are some portions of it of great public importance, one such portion being exactly what we are in need of in the present discussion. I refer to the exceedingly familiar but scientifically much neglected definite and sustained psychical differences of individuals who by reason of being members of the same household or same small community are subject to nearly identical influence so far as concerns such fundamental en-

vironic factors as food in the narrow sense, drink, air, light and temperature. The duty before us is that of testifying to, of *viséing*, the objectively psychical individual as we did the subjectively psychical individual earlier in this sketch. "What is needed," writes Sellars, "is not vague statements to the effect that individuals cannot be separated or that they are aspects of one another, but definitions and analyses." <sup>26</sup> Sellars is here raising his voice against the tendency in present-day social psychology to make the individual a kind of incident in the social order, a by-product of Society. It is a satisfaction that the regular course of my psychological argument has brought me to where I also may contribute something to the definition and analyses essential to checking the tendency indicated by Sellars. If it can be shown biologically and psychologically all in one that personality is indubitably objective, both substantively and kinetically, not only the Individual but Society will be the gainer, I am very sure. For my contribution we will examine in outline what may appropriately be called the action-system (adopting and expanding Jennings' term) as it manifests itself in a small homogeneous group of human beings. Our study will be, in other words, one in domestic and neighborhood psychology.

The "material" in this instance must be my own household and the handful of persons constituting the colony of the Scripps Institution for Biological Research. This group is rather specially favorable for such a study in that its geographic severance from other groups, and its strictly rural habitat give it an exceptionally natural, simple, and uniform environment. The analysis might run along any one or all of several axes; but our purpose will be accomplished by following one only. That one shall be the reaction, the behavior, of individual members of the group in response to the stimulus of the world war. Were completeness to be aimed at in the analysis, every individual in the

group would have to be considered. Such a treatment would be highly instructive but space limitations forbid us going to such length. We must restrict ourselves to a few of the more pronouncedly individualistic behaviors and must treat even these in a very sketchy fashion. To be remarked at the outset is the fact that every member of the group is deeply loyal to America and to the cause of the Allies. On the very door-sill of the examination we recognize two well-differentiated aspects to each person's action-system, namely an aspect of commonality for nearly all members of the group; and an aspect of very pronounced differentiality for many of them.

Behaviors-in-common will receive attention first. In the uniform growth, from the very beginning of the struggle in August, 1914, of belief in the general rightness of the cause of the Entente; of realization of the meaning of the struggle; and of sentiments and resolutions of devotion to the foreign nations with which our nation is finally joined, these experiences have been very much at one. To be sure this commonness has fallen far short of identity. But as to essentials resemblance has been far greater than difference. For example every adult has accepted unhesitatingly his and her obligations to the Red Cross; to the appeals for aid from Belgium, France, and the other despoiled countries; to the increasing cost of living; to the buying of Government Bonds; and to the appeals and regulations of the Food Administration. Naturally there has been difference in the particular way and extent of response of each in these matters; but in essence there has been nothing differential.

We turn now to behavior-not-in-common; behavior, that is, which has differentiated the members personally with great sharpness. This examination is much more important for the subject in hand. The reference here is to each one's "bit" as the common phrase had it when our country was first entering the conflict. The "war work" (as the expres-

sion has gradually become with the advance toward the climax of the gigantic struggle) into which each has gravitated has much the appearance of the naturalness and inevitability presented by the falling of a stone or the flowing of water. The case grows so significant at this point that I must particularize somewhat more than I have heretofore. *A* becomes an acknowledged leader in "drives" for Red Cross funds, Liberty Bond sales, etc. *B* becomes a regular consultant on the knitting of Red Cross articles. *C* is a highly skilled deviser and maker of dishes from "substitute" foods. *D* is appointed an official of the National Food Administration. *E* becomes an official teacher of girls and women as to the peculiar duties and obligations of their sex in war times. *F* concentrates nearly the whole of his physical energy upon an elaboration of the view that a victory over Germany and her allies cannot be really complete without being spiritual as well as material—that the philosophy or theory of life being fought for by Germany must be overthrown as well as her armed forces. Of the forty adult members of the group fully one-half have been incited in a special degree to some activity that has a distinct personal character, some of these, as above indicated, being very pronouncedly so. The personality of these reactions comes to view most distinctly in the fact, absolutely certain to an observer whose acquaintance with the persons has been intimate and has extended over some years, that no one of those who has settled into one of the special, definite, and important pieces of work could wholly replace any of the others in their special tasks. Probably each could do *something* at the "job" of any of the others were conditions such as to force him to try; but success under such conditions would surely be partial, very much so in some of the cases.

This automatic definition and classification of persons subject to a common major stimulus, with nearly the same general environic conditions, and with almost complete freedom

of action so far as concerns the particular stimulus, seems to me a phenomenon of very great importance since it depends upon principles of organic beings, especially upon principles of civilized man's "being," which are well-nigh if not entirely universal, I am sure. Undoubtedly the phenomenon is often much obscured through counteracting elements in the environment, especially in social customs, economic conditions and general education among civilized men. But in spite of all these, attentive observation will nearly always be able to recognize it. Highly significant is it as bearing on this particular aspect of the matter, that the niches finally found by most of the persons were obviously determined to some extent by long continued previous activities and unmistakable natural "gifts."

Another noteworthy fact is the clear indication of not mere acceptance, but positive satisfaction on the part of most if not all the persons, once they are "settled" to their "jobs," this satisfaction prevailing despite the strenuousness, perplexity, and wear-and-tear entailed. During the first weeks of America's plunge into the maelstrom the anxious psychical casting about in our little group, as throughout the whole land, presents to the anthropological biologist as he looks back upon it a case of trial and error on a gigantic scale, the scene being replete with jumbled elements of noble zeal, splendid efficiency, mis-expenditure of strength and funds, and ludicrous proposals. But out of this, as out of this unprecedented instance of world-wide "struggle for existence," there is quite sure to come, indeed is coming, as one of its first fruits, *personality* more real and powerful and fuller of grandeur than ever.

While personalities come forth with special distinctness of outline and forcefulness of expression during occasional events of vast import to the race like the present war involving literally the whole civilized portion of the human species, yet I would insist that the difference between the

manifestations at such times and at ordinary times is almost entirely one of degree, rather than of essential nature. The attentive observer will not fail to find personalities as here understood always and everywhere, no matter how simple and lowly the lives, and monochrome the external conditions. In little details of intelligent, but still more of reflex, instinctive, and emotional life, all of which compounded together makes what we often call temperament, the keen and sympathetic observer will always see *persons* in the deep sense here indicated. Not the transcendent genuises merely, the Aristotles, the Shakespeares, the Napoleons, have the right to be called personalities, because of the unique powers with which they are endowed; but each and every one of civilization's humblest-ranked myriads, and each and every nature-tutored denizen of the virgin forest, of the untilled plain, and of the unregenerate desert, have the same right-in-kind.

*Personality and the "Breath of Life" Viewed in the Light  
of Physical Chemistry of the Organism*

Swinging the discussion back now on the physico-chemical aspect of the organism, I recall first the truth alluded to a little while ago, namely, that it is preëminently the chemical rather than the physical attributes of elementary inorganic substances which furnish the distinguishing marks of these substances. Even in the inorganic world we saw that substances are most readily and decisively differentiated from one another by the transformation-products resulting from the reaction of the substances upon one another. "Transformation of energy," using a form of expression favored by the disembodiment tendencies in recent chemical theory, is the most distinctive thing about all chemistry, inorganic as well as organic. The oxidation and other chemically reactive changes and products of nickel and iron, we noticed, are the

most differentiative things about these metals. Let us push the application of this criterion of difference a little farther in comparing human persons. We give energy-transformation and work performed a leading place here also. And being naturalistically chemical rather than chemically chemical we are forced to touch the "high spots" only at first regardless of what may be in between them. We are free to seize upon the end or completed products of the reactions and transformations. What reaction-products, I ask, of nickel and iron towards any other substance or set of conditions are more unlike than the reaction-products of an efficient Department-of-Justice official, let us say and an efficient food conserving house-keeper, in this time of common national danger? Yet these diverse products may come from not only the same danger stimulus, but likewise from as nearly identical physico-chemical environic stimuli as it is possible to secure. Were official and house-keeper to eat of the same food, drink of the same fluids, breathe of the same air, and be subject to the same temperatures month in and month out the difference in product would not be a whit less.

So stands the case when viewed in its "high places" only. But the high places are as real places as any whatever. No realities, it matters not how obscure or subtle, pertaining to the intermediate places, can make the high places other than what they are. Judging human beings by what they do, by work done through the transformation of the substances and energies which they take from the external world, their personalities are surely not less well-attested than are the individualities of elementary chemical substances.\* But it will not do to be satisfied with touching the high places in this rather jaunty fashion. Some attention must be given to

\* A rather full discussion of the point here touched may be found in my essay, *The Higher Usefulness of Science*, where I raise and try to answer the query, "What is nature because man is a part of it?" Perhaps a less ambiguous way of asking the question would be, "What must nature be in order that it may produce such an animal as man?"



the subtler aspects of the problem. The little we shall do in this way may be introduced by the query, what reason is there for including in our hypothesis the supposition that it is "some substance in the air, almost certainly oxygen," with which the organism reacts chemically, to produce consciousness and all other phenomena of life? Why single out this substance from the other elementary substances essential to life, as for instance carbon or nitrogen? \* My reply begins by recalling the immemorial recognition of the "breath of life" the "life giving air" and so on, of universal experience. It is well to recall likewise such semi-philosophic conceptions as that of the *pneuma* or "psychical breath of life" of later Greco-Roman philosophy. The inextricable entanglement, historically, of breath and air with spirits is also worth remembering, especially the continuance of this into the modern period of scientific analysis, unmistakeable traces of which are seen in the writings of William Harvey and the foremost physiologists of the era to which he belonged. For example, the *spiritus nitro-aereus* of John Mayow which, we now know, was his term for oxygen as glimpsed first in the history of science, may be mentioned.

More important than any of these reminders from the history of knowledge is that of the familiar fact that the most crucial evidences of truly independent or autonomous life of the individual higher animal are respiratory. That the new born human babe's first breathing-act is its first genuine independent life-act is one of the most commonplace of truths. And recall how the "return of life" as we say of the nearly drowned person, and of one who has "fainted dead away" is marked by the resumption of respiratory activities. Certain reflexes, as those from stimulating the eyelids, and pos-

\* The argument in answer to this query should be taken as an extension of, and in important respects a replacement of, that contained in my essay, *Is' nature infinite?* wherein I discuss the specificity of individual organisms as indicated by how they use their nutrient substances.

sibly certain heart flutterings, may be more persistent movements than those connected with breathing. But these are less certain signs of individual life. It is only to philosophy of the elemental sort that the mere twitch of a hand or an eyelid or a trace of heart action would be a satisfactory proof of life. Nor would it be to a philosopher of this school should the "living substance" under observation happen to pertain to a loved relation or friend. *Satisfactory* evidence of life in this case would come only with the nearly simultaneous return of breathing and consciousness. A right interesting section could be written at this point on the importance of nutriment in the ordinary sense, and of drink, as compared with air at the very beginning and ending stages of the individual life. For instance such questions would have to be considered as that of the independence of the new individual for a while at the outset on food-yolk in many animals below the mammals, and on placental connections in mammals; that is on material metabolically elaborated by the older or parent individual. But such a discussion not being indispensable to this sketch, must be foregone. Enough here to emphasize the fact that while it may be entirely justifiable to regard oxygen as a food as some good modern physiologists do the two important facts should never be lost sight of that (1) oxygen (air) is the one and only ever-present and never varying constituent of the dietary. In other words that it is the one constituent which nature supplies as by "free grace" to use a good old theological expression; and that (2) oxygen is the one and only food that needs no digesting and so no digestive organs or tissues set apart for its metabolic elaboration.\*

Oxygen is the only food which passes directly as such to

\* Were the view held by some physiologists, that the alveolar epithelium of the lungs transmits atmospheric oxygen to the blood by an active process spoken of as a secreting, this statement would need modifying somewhat. However, the view does not seem to be accepted by most authorities.

every part of the organism. In oxygen the organism finds one of its most fundamental food materials for which it does not normally have to go in search or to compete with other organisms. The familiar fact and its significance appear not to have attracted the attention of biologists much. Even L. J. Henderson who has written so illuminatingly on many aspects of organic adaptiveness says nothing definite on this point. These two facts are weighty reasons for my proposal to look upon oxygen as one chemically elementary substance and the organism as another, the reaction between which is basal in the production of consciousness and all life phenomena. Consequently the problem of how, exactly, the organism endowed with full-fledged consciousness reacts toward oxygen is certainly one of the most important of all problems on the purely physico-chemical side of life. And, as said early in this sketch, it is just here that my theory is most avowedly hypothetical. It would be quite out of the question to present in the remaining pages of this book, even had I the requisite knowledge for doing so, all that might profitably be said on the subject. Consequently only two or three of what seem to me the most crucial matters will be mentioned.

In the first place I ask the reader to recall what has been said in various of the preceding chapters which have brought out the indubitable trend of the interpretation of life phenomena according to the principles of physical chemistry, away from the elementalistic conception of the organism. The interpretation of the organic cell as a system of phases in dynamic equilibrium, so strongly set forth by Hopkins and Bayless will be remembered. And this will call to mind the sharp way in which the new conception, with its appeal to the rôle of surface-layers, membranes, and areas of contact between all sorts of constituent substances, sets itself over against such pseudo-objective conceptions as that of biogens, not to mention the horde of out and out subjectivis-

tic "elements" of which pangens and determinants have perhaps had the greatest vogue. The importance of the anti-elementalistic tendency of physical chemistry when it comes to be applied to biological problems is greatly enhanced, it appears to me, by the circumstance that J. Willard Gibbs, who was one of the very first to appreciate in a full scientific sense the importance of massive as contrasted with minute-particle phenomena in inorganic nature, and so was one of the "fathers" of physical-chemistry, made no assumptions about the invisible composition of substances in his treatment of "Heterogeneous Equilibrium" and allied topics. "Certainly," writes Gibbs, "one is building on an insecure foundation who rests his work on hypotheses concerning the constitution of matter." <sup>27</sup> If this is true as touching the relatively simple structures and movements in the lifeless world how much more obviously true is it as touching the living world, and especially such life phenomena as human consciousness!

So we are able to requisition one of the admittedly most important advances of modern times in inorganic science as support for the supposition that the air we breathe, and presumably its oxygen, contributes in some direct and fundamental way to the production of consciousness even though this substance, if its "ultimate nature" is what inorganic chemistry and physics have hitherto attributed to it, has little or nothing to suggest that it possesses such a unique latent attribute. The reader should not fail to recall here Hume's recognition of the "secret powers" of substances.

But is it not possible that physico-chemical and physiological knowledge of oxygen and air, the "breath of life," do contain somewhat more to justify the supposition than is usually recognized? In this connection I relate that one of the most mentally adhesive statements I ever heard from a bio-chemist, its adhesiveness depending largely on the fact that the chemist was one of great experience as a laboratory

investigator, was to the effect that chemical analyses make known what they find and absolutely no more. In other words such analyses never exclude the possibility of substances other than those found. And this chemist asserted furthermore that all organic analyses leave residues to some extent. No manipulative methods are known, it appears, capable of effecting a really complete analysis of any organic substance. Whether these restrictions on analyses still hold I am not sure, though I have seen or heard nothing which leads me to suppose they do not.

It is this general shadow of manipulative imperfection which overhangs all formal physics and chemistry, coupled with the advances being made from time to time in our knowledge of oxygen and air which has led me to put into my hypothesis a shade of doubt as to whether oxygen is the constituent of the air the reaction of which with the organism produces consciousness. The demonstration of helium and argon, and probably neon, crypton, and xenon in atmospheric air, all within a little more than two decades, has influenced my thinking in the same direction. Besides, the idea, become a commonplace of physics and chemistry in a single night, figuratively speaking, that the "atom is as complex as the solar system" has had its part in shaping my conceptions; as have also such well-credentialed conceptions from the inorganic sciences as that "Uranium II" is "a long-lived element" which is the "parent of the actinium series of elements, but has no genetic connection with the uranium series"; and that "in the lead pleiad there are seven elements" having quite different atomic weights."<sup>28</sup>

The extent to which, as exemplified by this case, the inorganic sciences have found themselves driven into the organic realm for terms with which to express their new conceptions must impress every thoughtful person. Earlier, what we might describe as purely contemporaneous physical dynamics had to borrow such terms as energy, power, force, work,

from the nomenclature of living beings. Later, with the permeation of all knowledge by the conception of the natural or derivative origin of everything (a genuinely organic conception, notice), has come even for elementary chemical substances, the induction into physics and chemistry of such ideas as genetic relations, parenthood, and length of life. So my suggestion that the air we breathe must be recognized to possess latent attributes which by reacting with the organism produce consciousness, falls into a genetic series in the history of the interpretation of nature.

The very important question, as already indicated, of exactly how atmospheric or molecular oxygen operates in the living being generally and the conscious being particularly, is largely for the future to answer. One should never fail, however, to couple this question with the same question as to the behavior of oxygen, and for that matter of any other chemical substance, in any reaction whatever. Exactly how, for example, does oxygen operate with hydrogen to produce the attribute of refrangibility of water; or with phosphorus to produce the peculiar glow which that substance may exhibit under some conditions?

Concerning the positive knowledge and the views as to details of the action of oxygen in connection with the organism, only a little can be said here though that little may be very important. Looked at from the standpoint of the old, the orthodoxly atomistic chemistry, probably the most anomalous thing about my hypothesis is that the organism conceived as equivalent, chemically speaking, to an elementary substance, is the unquestioned fact that the organism is not only composed of several chemical substances, but that one of these is oxygen itself. Stated baldly, the anomaly is that two chemical substances are supposed to react upon each other, one of which (the organism) is known not only not to be simple, but to contain the other substance. But even the old chemistry with its "compound radicals," of which

cyanogen  $(\text{CN})_2$  is said to have been the first discovered, and of which the unitedly-acting combinations of carbon and hydrogen as methyl,  $\text{CH}_3$ , affords some slight support for our conception so far as the mere matter of chemically unitary compoundedness is concerned. In so far, however, as technical chemistry can be drawn upon for supporting our hypothesis, it is the new, or physical chemistry, as has been repeatedly stated, that is our main reliance. Unless I am greatly deceived, the real inwardness of that great movement in inorganic science is against the age-old conception of the ultimate adequacy of atoms to explain inorganic nature, almost as positively as the organismal conception is against the ultimate adequacy of any constituent element whatever, to explain organic nature. The surface energies, for example, developed at contact faces and giving rise to the phenomena of adsorption \* appear to be not a whit less real and ultimate energies than are any that can be attributed to atoms and molecules taken as such. And, be it noticed, one of the most distinctive things about these areal and massive energies is that they dominate atomic and molecular energies to a certain extent. This is just what the now universally recognized principle of "mass action" is in so far as such action has been studied enough to make possible its formulation into law; that is enough to learn how it influences velocity and quantity of chemical change. But would any careful physicist or chemist pretend to know to a certainty that such action is restricted to influence of that sort? Surely not. Are we certain for instance that it can not under any

\* *Adsorption* is the loading of the surface of a solid body immersed in a solution, with the dissolved substance. Thus it is by adsorption that charcoal takes the coloring matter out of a colored solution. The action results from the facts that there is surface tension at the interfaces between the charcoal and the liquid, and that this tension is lessened by the presence of the dissolved color-substance in the liquid. The substance then moves to the place of lessened tension and concentrates on the surface of the solid.<sup>20</sup> The principle has very wide application in nature, particularly in organic nature, where colloidal substances and water are in contact so extensively.

circumstances influence qualitative as well as quantitative change? Surely we are not. This of course is far from contending that mass action actually does influence qualities. My sole point is that so long as there is lack of certainty that it does not or may not exert such influence any assumption which implies such certainty is unwarranted and unscientific.

Putting together, then, the physically massive conceptions of inorganic chemistry and the organismal conceptions of bio-chemistry what seems to follow touching the chemico-substantive composition of organisms is that a portion of all the substances essential to life, carbon, oxygen and others, have been combined from all eternity (whatever be the meaning of the phrase) in the peculiar way called organic, while other portions have remained in the state called inorganic. This leads me to remark, quite incidentally so far as this discussion is concerned, that according to this view the assumption would be that organisms have always existed, or at least that they have existed as long as "matter" or anything else of which we have any information or clear conception, has existed. The warrantableness of this assumption I am relieved from arguing here from having treated the problem at some length in another place. (*Are we obliged to suppose the spontaneous generation of life ever occurred?*)<sup>30</sup> All that need be said now about the outcome of that discussion is that the warrantableness lies in the absence of any ground for assuming the contrary. I take my position squarely on the direct evidence in the case. All the evidence of that sort we have—and in that discussion I emphasize the fact of its vast quantity—is to the effect that organisms are produced by other organisms known as parents and in no other way.\*

\* To the stock and rather vapid rejoinder that such a solution of the problem of the origin of life is no solution at all, but only a putting off of the difficulty, the obvious reply from my standpoint is that I am making no pretense of "solving the problem," as "solution" would be meant in the anticipated rejoinder. From my standpoint, however, the everlastingly-from-parents hypothesis would be a solution of the problem if the hypothesis were proved true.



We can now state briefly as much more of the bio-chemical aspect of the problem as seems indispensable to our present argument. A few remarks on what the physiology of our day often calls tissue respiration will compass what is in mind. The key fact in this is of two-fold character: (1) The tissues of the organism, not its blood or any other fluids, contain the substance which is in the strictest sense living. (2) This substance is called living because chemical changes of a very distinctive sort are going on in it. These changes are of a fundamentally double nature as regards atmospheric or molecular oxygen; namely, combinative and incorporative change, and separative and expulsive change. The last-mentioned, the separative and expulsive change, is known as oxidation and manifests itself to ordinary experience in the discharge of oxygen combined with carbon as carbon dioxide, and in the setting free of energy in the form of muscular and other work, and of heat. The first-mentioned, or incorporative change, consists in taking in and storing up oxygen, "somehow," as the more carefully worded physiologies put it. This statement may be taken as a very brief natural history description of the most fundamental steps in what formal physiology calls metabolism with its two aspects, the constructive, or anabolic, and the destructive, or katabolic. Probably no one will question that this conception of the foundations of the life process for nearly, if not quite, all animal life is that held by the best physiologists since the time of C. Bernard at least. No physiologist whom I have consulted has stated the nature of the process more definitely than has Sir Michael Foster. "The Respiration," he writes, "of the muscle then does not consist in throwing into the blood oxidizable substances, there to be oxidized into carbonic acid and other matters; but it does consist in the assumption and storing up of oxygen somehow or other in its substance, in the building up by help of that oxygen of explosive decomposable substances, and in the carrying out

of decompositions whereby carbonic acid and other matters are discharged first into the substance of the muscle and subsequently into the blood.”<sup>31</sup> And he points out in other connections that what is true of muscle in this regard is essentially true of all other tissue systems. In another still more recent text book we read: “Nothing definite is known, however, as to the nature of the probable combinations formed by oxygen with the different materials for building up muscles and other tissues, or of the intermediate anabolic and katabolic forms through which it passes in combining with carbon into carbonic acid.”<sup>32</sup> And this author then expresses what are, apparently, his own views, by quoting from Foster as follows: “The whole mystery of life lies hidden in the story of that progress [that of construction and destruction in the tissues] and for the present we must be content with simply knowing the beginning and the end.”

The kernel of my suggestion so far as metabolism is concerned, is that the anabolic, or the assimilative, the truly synthetic aspect of the complete operation, is the continual renewal, or keeping up of the oxygen constituent of the organism which comes to it by heredity, that is which has always been in the “line of descent.” It is the maintenance of what might be spoken of as the original oxygen constituent of the organism. There would always then be operating in the organism oxygen of two sources, that from the one source designated, employing our well-established evolutionary terminology, phylogenic or hereditary oxygen; and the other ontogenic or individual oxygen. In general the same kind of reasoning would hold for the other chemical simples, carbon, nitrogen, and so on; but these are in quite a different status from oxygen owing to the fact that they are not normally taken by the animal organism in the pure or uncombined state, but only in some other organic combination, as food in the ordinary sense.

Metabolically expressed, then, we may say in short that

the warrantableness for considering the individual organism as a chemical element, is the fact that it maintains its identity as regards all its elementary constituents except one, oxygen, by wrenching these, so to speak, from other organic compounds (by digesting these) and then by synthesizing the elements into its own particular substance. Another way of expressing the same conception is to say that the organism is an element, chemically speaking, because it reacts directly in a chemical sense with another element.

Did this chapter pretend to be anything more than a sketch of a theory of consciousness a considerable discussion of the "activation" of oxygen would naturally come in somewhere, perhaps at this point. The essence of activation is the fact that when oxygen passes into the organism by the respiratory process it is somehow changed into a condition which enables it to oxidize living tissue-substances as it can not to any degree, seemingly, when brought into contact with the same substances outside the organism. This discussion would involve the various theories which have been put forward to account for this phenomenon, as those which make use of the principle of enzymes, of peroxides or of some other. All that our aims here require us to notice is that nothing conclusive as touching the nature of activation would come from the discussion. How unsatisfactory a state this whole subject is in may be seen from the following words of a foremost American biochemist: "It has been a popular practice to appeal to hypothetical enzymes to explain some of the obscure chemical transformations in the organism. Thus we have been wandering through the mazes of the oxidases, oxygenases, peroxidases, reductases, catalases and other products of perplexing nomenclature in the hope of escaping the uncertainties of intermediary metabolism." <sup>33</sup>

*Summed-up Statement of Justification of the Hypothesis*

The final gathering-up-and-putting-together may now be made of all that has been said about the physico-chemical aspect of the organism on the one hand, and about its psychical aspect on the other. That is to say, we are now ready to epitomize the results of our examination of the ancient and honorable but withal unsolved problem of how Body and Soul go together. As regards "body" or "the physical" we have been led to the physico-chemical conception of the organism as a well-nigh inconceivably complex mass of substances, mostly in the colloidal state, operating as a system of phases in dynamic or constantly changing equilibrium. As regards "soul" or "the psychical," we have found also a series of phases of activities, namely the phases of intellect and reason, those of instinct, those of feeling and emotion, those of the will, those of the tropisms and the "simple reflexes," and finally those of simple protoplasmic response. According to my hypothesis, the phases of the bio-chemico-physical sort and the phases of the psychical sort have common ground in the organism as a whole, the phases of intellect and reason corresponding to the cerebro-spinal nervous system; the phase of instinct corresponding probably to the autonomic nervous system; the phases of feeling and emotion corresponding mainly to the glandular and visceral systems; those of the will to the body-muscular system; those of the tropisms and simple reflexes to the receptor-conductor-effector systems; and finally those of simple protoplasmic response to the fundamental protoplasmic mechanism of response, whatever its structure.

According to the scheme presented in the sketch and summed up here, just as physical functioning and physical form reach back to the very dawning of animal life, both in the individual and in the race or type, so consciousness with its nether limits in what, following the terminology of em-

bryology (see section on the pro-morphology of the egg-cell, Chap. 8 *The Unity of the Organism*), might be called pro-consciousness, is an attribute of all animal organisms. As comparative anatomy and physiology have made us familiar with the physical aspect of the animal organism existing as the fully realized or developed adult at one end of the ontogenic series, and as the unrealized adult or germ at the other end of the same series, exactly so is psychology gradually familiarizing us with the realized, or adult mind at one end of the ontogenic series, and as the unrealized or germinal mind at the other end of the same series. When we affirm that the completed individual organism is latent in the germ, we must understand that the psychical aspect no less than the physical aspect is so latent. With very little doubt, it seems to me, the real meaning of the so-called sub-conscious, and of psycho-analysis as a method of investigating it, is that the ontogenic stages of the psychic life of the human organism are being discovered and that a method of investigating these stages is being worked out. Freud and his followers have been and still are somewhat in the dark, I think, as to just what they are doing, albeit their discoveries and methods are of the utmost importance.

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## POSTSCRIPT

(To "The Unity of the Organism")

**T**HE argument in favor of the organismal way of viewing living nature has now run what appears to me its natural course, to its inevitable end. Yet I cannot bring myself to write "Finis" without making a few remarks which though connected vitally with the argument, do not seem an essential part of it.

These remarks concern the general effect of the organismal standpoint on those who may grasp it firmly and adopt it unreservedly. Since, as pointed out in the "Historic Background" with which this book opens, the standpoint has been recognized by biologists with varying degrees of fullness from the time of Aristotle at least, there can be no doubt that the human mind is naturally attuned, as one might say, to this general type of response to organic phenomena. It seems therefore fitting that a presentation like that which I have made should be accompanied by a few words on the probable influence of a wide prevalence of the organismal view. The pertinent question will be asked, how could it have come to pass that if the standpoint has been so long in the world it should have missed full recognition and have failed to exert its due influence? The reply is obvious to an attentive reader of this book: At no time until the present in the long historical growth of knowledge of the living world has information been sufficient to make possible a rounded-out statement of the conception. To illustrate, it is only in the very last years that enough has been known of the physical chemistry of the cell to engender such an interpretation of this exceedingly important biological entity as that which biochemists are just now reaching. Yet this interpre-

tation is indispensable to anything even approaching a full development of the organismal view.

But nothing stands out more boldly from the pages of this book than the insufficiency even yet, of actual knowledge for making the standpoint complete. If therefore, I append to my presentation a brief reference to the larger effect the view has had on myself, and on this basis forecast what the effect would be on thinking people generally were they to make it their own, such a forecast will surely be in harmony with the larger purpose of the book, even though the anticipatory remarks have no place in the presentation itself.

The long and laborious gathering and arranging of facts, and weighing of natural evidence and formal arguments which has constituted the development of the standpoint in my own mind, has compelled me to re-examine and re-assess the whole frame and fabric of my spiritual life. Nothing, so far as I can tell, has escaped. Not my scientific knowledge alone—my professional stock-in-trade—but all my ideas and beliefs touching religion, art, society, politics, industry, personal relations, and private living, have come in for their share of scrutiny and renovation.

An exceedingly brief "synoptic" classification and characterization\* of the entire range of these effects can be given in the terms of formal science and philosophy.

As to classification, the effects fall into a two-fold grouping. One of the groups appertains to the great province of the nature of knowledge; the other to the equally great province of the nature of morals.

The characterization of effects on the nature of knowledge which seems to me most inclusive and most practically significant, may be stated thus: By the validation of objective knowledge, largely through the principle of what I have called standardization of reality, but partly through

\* See my essay, *The Place of Description, Definition and Classification* (Ritter, 1918).



the organismal hypothesis of consciousness, such knowledge is elevated to the rank of strict equality with "pure thought," often so-called; that is, with subjective knowledge. In this way mathematico-mechanistic science is deprived of the regal place it has claimed for itself since the era of Descartes and Leibnitz, and is brought to the plane of absolute equality as to importance and dignity, with sense-experiential science. By thus adjusting the claims of these two great realisms of science, an attitude toward the infinite totality of nature, and a methodology for interpreting it, which have hitherto borne the stamp of subjection and inferiority assume their rightful places in the great hierarchy of philosophical science. This leveling-down of mathematical mechanics and the deductive method and leveling-up of observational knowledge and the inductive method, implies the complete overthrow of psycho-physical dualism in psychology, and the rescue of personality from bondage to a theoretically infinite monotony of "Matter and Energy."

The characterization of the effects of the organismal view on morals centers around the perception that in the establishment of human personality the persons are organically interdependent upon one another; that is, interdependent through their "attributes of relation," this resulting in the incorporation of men into a pluralistic universe far more real and vital than philosophic pluralism has hitherto been in position to grasp. Through a type of human conduct guided by knowledge of these principles of personality and the interdependence of personalities, and through supplementing mathematico-mechanistic methods of study by a rigid application of observational and statistical methods, a genuine science of morals, both theoretical and practical, is made attainable.

That my enterprise of developing the organismal view is only part and parcel of the general current of interpretation of living nature which has flowed through the centuries seems

clear even from my meager acquaintance with the history of philosophic thought. Thus we read in Windelband (*A History of Philosophy*, Eng. by Tufts,): "For the decisive factor in the philosophical movement of the nineteenth century is doubtless the question as to the degree of importance which the natural-science conception of phenomena may claim for our view of the world and life as a whole." (624). Then after speaking of the sharp antithesis between the *Weltanschauung* elaborated by the "Highly strained idealism of the German Philosophy" of the early nineteenth century, and the "*materialistic Weltanschauung*" of the later decades of the same century, the author writes: "If we are to bring out from the philosophical literature of this century and emphasize those movements in which the above characteristic antithesis has found its most important manifestation, we have to do primarily with the question, in what sense the psychical life can be subjected to the natural-science mode of cognition." (p. 625).

That Part II of this book of mine, especially Chaps. 20 to 24, go a long way toward answering the cardinal question formulated by Windelband appears to me certain. And, I may add, it also seems quite clear to me that the gigantic struggle at arms which that philosopher's nation has now brought upon the world, is one of the strongest proofs that philosophic thought and, following this, social and political leadership in Germany have failed miserably to discover the *Via Media* between the *Weltanschauung* of the "highly strained idealism of the German Philosophy" and the *materialistic Weltanschauung* which has finally reached its natural climax in militaristic brutism, and is almost certainly (Sept., 1918) approaching its overthrow.

Nothing could more fittingly end this book, devoted as it is to demonstrating the operative nature of organic unity in one of its great segments, than a reference to the fact that the philosophy of life now determining German morals,

and which has drawn its inspiration largely from the hypothesis of natural selection, has failed—pathetically beyond the power of words to express if done unintentionally; and criminally in equal measure if done intentionally—to understand the real meaning of Darwin's teaching as a whole.

Certain it is that had the German philosophers of *Macht-politik* recognized the place of unqualified supremacy ascribed by Darwin to the mental and moral endowments of man, it would have been impossible for them to make the dogma of survival of the fittest serve their ends in any such way as they have made it, and done so honestly. Attentive reading of *The Descent of Man* makes it perfectly plain that Darwin simply accepted all the higher human attributes—moral, esthetic, and religious, no less than those of the intellect—as fundamental data in his reasoning about man's evolution. His sole effort as touching these was merely to see in how far they could be regarded either as helped forward in their development by natural selection, or at least as not inconsistent with it. Apparently it never even occurred to him to regard his hypothesis as supreme-over-all, so that all attributes whatever, the noblest ones of man with the rest, must either be forced into conformity with it, or their reality and power virtually denied. "I fully subscribe to the judgment," runs the opening sentence of the chapter on "The Moral Sense," etc., "of those writers who maintain that, of all the differences between man and the lower animals, the moral sense or conscience is by far the most important." And, especially significant at this time, Darwin quotes with obvious approval, an apostrophe to Duty by Kant, in which this "Wondrous thought" is represented as "holding up its naked law" in the soul, and demanding reverence. Darwin's entire discussion in this part of the *Descent* makes it clear that what he had in mind was to discover as far as possible the germs of "conscience," of "feeling of right and wrong," of an "inward monitor," of

“sympathy,” of “parental and filial affection,” of “social affection,” of the “instinct of self-sacrifice” and so on, in the lower animals so as to have a starting point for these attributes as they occur in civilized man. It was not at all his purpose to show, as the German perversion of the struggle-and-survival hypothesis holds, that the evolution of man has consisted largely in a farther differentiation and intensification of the dominantly brute attributes, with an infusion as a kind of by-product from the struggle for existence, of certain “humanistic sentimentalities,” which in reality are signs of weakness and must be suppressed.\*

And this perversion by German science and philosophy of Darwin’s teaching is rooted very deep in German culture and character. The straightforward, common-sense descriptions and inductions of the practical-minded, country-dwelling, country-loving, unacademic English naturalist were altogether too simple and unsophisticated to satisfy a *Kultur* permeated through and through with the “highly strained idealism” of Kant, Fichte, Hegel, and Schopenhauer. The two worst errors committed by Darwin were his over-emphasis on the natural selection hypothesis, and his propounding of the gemmule-pangenesis hypothesis; and it is highly characteristic that it was in just these two “strained” speculations that German biology and practical philosophy should have taken up Darwinism the most ardently and over-worked it the most absurdly and disastrously.

My examination of the germplasm-determinant theory of Weismann in Part I of this book has revealed something of the scope and nature which the gemmule fallacy was destined to assume when it fell subject to German speculation. The more subtle and far-reaching and humanly practical consequences of the adoption and elaboration of the struggle-and-

\* The effort which Dr. George Nasmyth has made in his book *Social Progress and the Darwinian Theory* to set right Darwin’s position in this matter, ought to bear fruit after a while.

survival hypothesis by German speculation has not yet been subjected to thorough-going biological criticism, though several moves in this direction have been made.

Even the realism of recent German political and economic theory and practice is a "highly strained" speculative realism. This philosophical monstrosity is largely attributable, demonstrably so I believe, to a cultural and governmental system in which the principle of universal organic personality is grossly violated. And what a price in misery and blood and treasure the whole world, but old Europe particularly, is paying for a consummation which a truer philosophy of life would have foreseen and forestalled!

Can the leaders of German *Kultur* be convinced of the fundamental fallacy of their theory of human and national life, only by discovering that their military establishment, built up through many decades of patient, costly organization and discipline, but under guidance of a philosophy of mechanism and brutism, is yet incapable of overpowering a military establishment, a large portion of which may be improvised in the course of a few months, if such improvisation be under guidance of a philosophy of personality and humanism?



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